LEVEL II

DEPARTMENT OF TRANSPORTATION

COAST GUARD

CHRIS

Hazardous Chemical Data

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COMMANDANT INSTRUCTION M16465.12 (old CG-446-2)

Subj: Manual Two of the Chemical Hazards Response Information System (CHRIS)

1. PURPOSE. This revision adds 500 chemicals, corrects errors, and adds new data to CHRIS. A further expansion from the present 900 to approximately 1000 chemicals will be made in the future. This manual provides the On-Scene Coordinator or other officials with some of the technical information necessary to properly respond to discharges of hazardous chemicals. The information provided in this manual may also be used for contingency planning and orientation. This manual is one part of CHRIS and is fully effective only when used in conjunction with the other system elements, COMDTINST's M16465.11, .13 and .14 (series).

2. DIRECTIVES AFFECTED. Manual Two of the Chemical Hazards Response Information System (CG-446-2) is hereby cancelled.

3. ACTION. District Commanders and appropriate unit commanding officers shall ensure that proper training in the use of CHRIS is conducted frequently for all response personnel.

4. CHANGES. The submittal of recommended changes and corrections to COMMANDANT (G-WEP) is encouraged.

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RECORD OF CHANGES

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1. INTRODUCTION

The Chemical Hazard Response Information System (CHRIS) is designed to provide information needed for decision-making by responsible Coast Guard personnel during emergencies that occur during the water transport of hazardous chemicals. CHRIS also provides much information that can be used by the Coast Guard in its efforts to achieve better safety procedures and so prevent accidents.

CHRIS consists of four handbooks or manuals, a hazard assessment computer system (HACS), and technical support personnel located at Coast Guard headquarters. These components and their relations to one another are described in Section 2 of this manual.

2. COMPONENTS OF CHRIS

2.1 A CONDENSED GUIDE TO CHEMICAL HAZARDS

The Condensed Guide contains information needed to help personnel make the proper *response* in an emergency situation; it is the only CHRIS handbook that will be carried to the actual scene of an accident. It is intended for use by port security personnel and others who may be the first to arrive at the site of an accidental discharge or fire and who need readily available and easily understood information about the hazardous properties of the chemical involved. It will be used to determine the proper actions that should be taken immediately to safeguard life and property and to prevent contamination of the environment.

The Condenced Guide briefly describes the chemical and biological hazards of various materials so that personnel at the scene of an accident can assess the danger and consider the appropriate large-scale response. It also lists the on-scene information needed for proper use of the Hazard Assessment Handbook. Selected information on each chemical covered by CHRIS is summarized from the more extensive material in the Hazardous Chemical Data Manual and is presented on a single page

2.2 HAZARDOUS CHEMICAL DATA

This manual is the cornerstone of CHRIS. For each substance, it lists the specific chemical, physical, and biological data needed for the preparation and use of the other components of the system. It can also be used after the initial response action, when there is sufficient time to use more detailed information.

The Hazardous Chemical Data Manual is intended for use primarily by the On-Scene Coordinator (OSC) and by Regional and National Response Centers for devising, evaluating, and carrying out response plans.

Much of the quantitave information found in the Hazardous Chemical Data Manual is needed for the hazard assessment calculations described in the Hazard Assessment Handbook. The Hazardous Chemical Data Manual contains the so-called Hazard Assessment Code which directs the user of the Hazard Assessment Handbook to the appropriate calculation procedure. The Hazardous Chemical Data Manual also suggests general responses to an accidental discharge wnich summarize the detailed information given in the Response Methods Handbook.

2.3 HAZARD ASSESSMENT HANDBOOK (CG-446-3)

The Hazard Assessment Handbook describes procedures to be used for estimating the quantity of a hazardous chemical that may be released accidentally during shipment. It also describes how to estimate its concentration in air and in water as a function of time and distance from the discharge. Methods for predicting the resulting toxicity, fire, and explosion effects are also described. The calculations use data from the Hazardous Chemical Data Handbook.

2.4 HAZARD ASSESSMENT COMPUTER SYSTEM

The Hazard Assessment Computer System (HACS) is a computerized version of the Hazard Assessment Handbook. It permits trained headquarters specialists to obtain very detailed hazard evaluations quickly, when requested by OSC personnel. Methods for using HACS are described in the Hazard Assessment Handbook.

Although HACS and the Hazardous Chemical Data Handbook are based on the same original body of data, differences will occasionally arise because HACS is more readily updated than the printed manual.

2.5 RESPONSE METHODS HANDBOOK

The Response Methods Handbook is written specifically for Coast Guard OSC personnel who have had some training or experience in hazard and pollution response. The handbook describes cautionary and corrective response methods for reducing and eliminating hazards that result from chemical discharge.

Although general types of response are suggested in the Hazardous Chemical Data Handbook, the specific response, to be chosen from among those described in the Response Methods Handbook, should be determined by the results from the Hazard Assessment Handbook.

2.6 REGIONAL DATA BASE

The Coast Guard's Regional Contingency Plans, although not considered a part of CHRIS, are an important adjunct to the system. Each Regional Contingency Plan contains a section (Annex XX) that presents data on a specific region, sub-region, or locale. These data, which are intended for use by OSC personnel, include such information as the following:

- An inventory of physical resources and strike forces;
- Vulnerable or exposed resources (critical water-use areas);
- Potential pollution sources;
- Geographic and environmental features;
- Cooperating organizations;
- Recognized experts with identified skills.

3. EXPLANATION OF TERMS

This section explains the special terms used in the data sheets in Section 11, gives the sources of specific items, and includes other information that will be useful to the reader in interpreting the data. The paragraphs below are keyed to the relevant portions of Section 11 by the subheading and number used in the data sheets.

The expression "Not pertinent" means that the data item either has no real meaning (such as the flash point of a nonflammable chemical) or is not required for assessing a hazardous situation. The expression "Data not available" means that the information sought was not found in the general or specialized data sources listed in Section 10 of this manual. In a few cases where important data were not available, values were estimated by usually reliable procedures: all such values are labeled "(est.)". If more accurate values for those items are found, they will be included in later revisions.

The *name* used for each of the chemicals included in the CHRIS manuals is either (1) that specified in the Code of Federal Regulations, Title 46, Table 151.01-10(b) (Compounds Regulated by Subchapter O) and Table 151.01-10(d) (Compounds to be Regulated by Subchapter D) or (2) a common name for those chemicals not now regulated by Subchapters O and D but known to be hazardous during shipment. The data sheets are arranged in alphabetical order by chemical name, not by the 3-letter code.

The *3-letter code* is designed to facilitate correct identification of chemicals in oral or written communication. The code should be used only *in addition* to the compound name: it should not be used alone. For transmitting the code, use the phonetic alphabet given in the "International Code of Signals."

1. RESPONSE TO DISCHARGE

In every case of a discharge or leak, it is obvious that an effort should be made to reduce, stop, or contain the flow of material at its source if this can be done safely. The purpose of the terms used in this section is to describe in a general way the cautionary and corrective responses that are described in greater detail in the Response Methods Handbook.

- *"Issue warning"* is used when the chemical is a *poison*, has a *high flammability*, is a *water contaminant*, is an *air contaminant* (so as to be hazardous to life), is an *oxidizing material*, or is *corrosive*. In the Response Methods Handbook the italicized properties are the bases for cautionary responses to restrict ignition, and to restrict contaminated water for human use, farm use, and industrial use.

- *"Restrict access"* is used only for those chemicals that are unusually and immediately hazardous to personnel unless they are protected properly by gas masks, eye goggles, protective clothing, etc. In the Response Methods Handbook this cautionary response is sometimes used in a broader sense to ensure exclusion of spectators and others who might ignite flammable compounds.

- *"Evacuate area"* is used primarily for unusually poisonous chemicals or those that ignite easily. The same expression is used in the Response Methods Handbook for this cautionary response.

- *"Mechanical containment"* is used for water-insoluble chemicals that float and do not evaporate readily. In the Response Methods Handbook the corresponding corrective response is "Contain".

- *"Should be removed"* is used for chemicals that cannot be allowed to disperse because of their harmful effect on humans or on the ecological system in general. The term is not used unless there is a reasonable chance of preventing dispersal, after a discharge or leak, by chemical and physical treatment.

- *"Chemical and physical treatment"* is recommended for chemicals that can be removed by skimming, pumping, dredging, burning, neutralization, absorption, coagulation, or precipitation. The corrective response may also include the use of dispersing agents, sinking agents, and biological treatment. Specific procedures to be followed are found in the Response Methods Handbook. Cleaning of the shoreline is also specified there for some compounds.

- *"Disperse and flush"* is used for chemicals that can be made non-hazardous to humans by simple dilution with water; a corresponding corrective response is used in the Response Methods Handbook. In a few cases the response is indicated even when the compound reacts with water because, when proper care is taken, dilution is still the most effective way of removing the primary hazard.

2. LABELS

The labels illustrated in Section 2 are those specified by the United Nations Labelling System (see Code of Federal Regulations, Title 49, Part 172). Labels are shown for all chemicals that are listed by name in the Code of Federal Regulations and also for most flammable chemicals that fall under listed generic categories, such as "Solvents," "Distillates," or "Alcohols."

3. CHEMICAL DESIGNATIONS

3.1 Synonyms –Alternative systematic chemical names and commonly used trivial names are given. Commercial or trade names are shown in a few cases where they are in common use. An index of synonyms is included in this manual (Section 8); it includes only those names given in Section 3.1.

3.2 Coast Guard Compatibility Classification – An entry is made when the chemical has been assigned to one of the 43 cargo groups listed in Navigation and Vessel Inspection Circular No. 4-75, "Guide to Compatibility of Chemicals." Appropriate parts of the Guide are included in this manual. Some chemicals not now included in the Guide were assigned to a group by the Cargo and Hazardous Materials Division, Coast Guard Headquarters. If the chemical is not a liquid carried in bulk in ships' tanks, this data item is "Not applicable."

3.3 Chemical Formula – This has been limited to a commonly used one-line formula. In the case of some organic compounds it has not been possible to represent chemical structure within such a limitation.

3.4 IMCO/United Nations Numerical Designation – The designation is that of the "International Maritime Dangerous Goods Code" published by the Inter-Governmental Maritime Consultative Organization (IMCO), London, 1972.

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped) – All chemicals that are listed in Code of Federal Regulations, Title 46, Tables 151.01-10(b) and 151.01-10(d) are shipped as liquids. Other designations include liquefied gas, liquefied compressed gas, and solid. Where a compound may be shipped either as a liquid or solid, both designations are given.

4.2 Color – All color descriptions found in the common reference sources are included. The color description is that for pure material. Occasionally the color of a chemical changes when it dissolves in water or becomes a gas.

4.3 Odor – All odor descriptions found in the common reference sources are included. The expression "characteristic" is used only when no other reasonable description was found. The odor description is that for pure material.

5. HEALTH HAZARDS

5.1 Personal Protective Equipment – The items listed are those recommended by (a) manufacturers, either in technical bulletins or in Material Safety Data Sheets, (b) the Manufacturing Chemists Association, or (c) the National Safety Council, for use by personnel while responding to fire or accidental discharge of the chemical. They are intended to protect the lungs, eyes, and skin. Safety showers and eyewash fountains are considered to be important protective equipment for the handling of almost all chemicals; they are not usually listed.

5.2 Symptoms Following Exposure – These are brief descriptions of the effects observed in humans when the vapor (gas) is inhaled, when the liquid or solid is ingested (swallowed), and when the liquid or solid comes in contact with the eyes or skin.

5.3 Treatment for Exposure – "First-aid" procedures are recommended. They deal with exposure to the vapor (gas), liquid, or solid and include inhalation, ingestion (swallowing) and contact with eyes or skin. The instruction "Do NOT induce vomiting" is given if an unusual hazard is associated with the chemical being sucked into the lungs (aspiration) while the patient is vomiting. "Seek medical attention" or "Call a doctor" is recommended in those cases where only competent medical personnel can treat the injury properly. In all cases of human exposure, seek medical assistance as soon as possible.

5.4 Toxicity by Inhalation (Threshold Limit Value) – The threshold limit value (TLV) is usually expressed in units of parts per million (ppm) – i.e., the parts of vapor (gas) per million parts of contaminated air by volume at 25°C (77°F) and atmospheric pressure. For a chemical that forms a fine mist or dust, the concentration is given in milligrams per cubic meter (mg/m^3). The TLV is defined as the concentration of the substance in air that can be breathed for five consecutive eight-hour workdays (40-hour work week) by most people without adverse effect.* As some people become ill after exposure to concentrations lower than the TLV, this value cannot be used to define exactly what is a "safe" or "dangerous" concentration.

No entry appears when the chemical is a mixture; it is possible to calculate the TLV for a mixture only when the TLV for each component of the mixture is known and the composition of the mixture by weight is also known.

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*American Conference of Governmental Industrial Hygienists, "Threshold Limit Values for Substance in Workroom Air, Adopted by ACGIH for 1972"

5.5 Short-Term Inhalation Limits – The parts of vapor (gas per million parts of contaminated air by volume at 25°C (77°F) and atmospheric pressure is given. The limits are given in milligrams per cubic meter for chemicals that can form a fine mist or dust. The values given are the maximum permissible average exposures for the time periods specified. Most of the data came from the Commonwealth of Pennsylvania, Department of Environmental Resources, Title 25, Article IV, Chapter 201 (1971). Some of the data (called "Emergency Exposure Limits") were provided by the Committee on Toxicology, National Academy of Science – National Academy of Engineering, National Research Council.

In some instances the values disagree, or the short-term limits overlap the TLV given in 5.4. These are not errors; the values were supplied by several laboratories, each of which used its own experimental techniques and methods of calculation.

5.6 Toxicity by Ingestion – The Grade and corresponding LD_{50} value are those defined by the National Academy of Sciences, Committee on Hazardous Materials, "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," Washington, D.C., 1972. Data were also collected from other sources and converted to the appropriate Grade before entry in this manual. The term LD_{50} signifies that about 50% of the animals given the specified dose by mouth will die. Thus, for a Grade 4 chemical (below 50 mg/kg) the toxic dose for 50% of animals weighing 70 kg (150 lb) is 70 x 50 = 3500 mg = 3.5 g, or less than 1 teaspoonful; it might be as little as a few drops. For a Grade 1 chemical (5 to 15g/kg), the LD_{50} would be between a pint and a quart for a 150-lb man. All LD_{50} values have been obtained using small laboratory animals such as rodents, cats, and dogs. The substantial risks taken in using these values for estimating human toxicity are the same as those taken when new drugs are administered to humans for the first time.

5.7 Late Toxicity – Where there is evidence that the chemical can cause cancer, mutagenic effects, teratogenic effects, or a delayed injury to vital organs such as the liver or kidney, a qualitative description of the effect is given.

5.8 Vapor (Gas) Irritant Characteristics – The most appropriate of five statements listed below is given. (Source: National Academy of Sciences, Committee on Hazardous Materials, "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," Washington, D.C., 1970.)

(1) Vapors are nonirritating to eyes and throat.

(2) Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

(3) Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

(4) Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.

(5) Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 Liquid or Solid Irritant Characteristics – The most appropriate of the following five statements is given (same source as 5.8 above):

(1) No appreciable hazard. Practically harmless to the skin.

(2) Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.

(3) Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.

(4) Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.

(5) Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5.10 Odor Threshold – This is the lowest concentration in air that most humans can detect by smell. The value cannot be relied on to prevent over-exposure, because human sensitivity to odors varies over wide limits, some chemicals cannot be smelled at toxic concentrations, odors can be masked by other odors, and some compounds rapidly deaden the sense of smell.

6. FIRE HAZARDS

6.1 Flash Point – This is defined as the lowest temperature at which vapors above a volatile combustible substance will ignite in air when exposed to a flame. Depending on the test method used, the values given are either Tag closed cup (C.C.) (ASTM D56) or Cleveland open cup (O.C.) (ASTM D93). The values, along with those in 6.2 and 6.7 below, give an indication of the relative flammability of the chemical. In general, the open cup value is about 10° to 15°F higher than the closed cup value.

6.2 Flammable Limits in Air – The percent concentration in air (by volume) is given for the lower (LFL) and upper (UFL) limit. The values, along with those in 6.1 and 6.7, give an indication of the relative flammability of the chemical. The limits are sometimes referred to as "lower explosive limit" (LEL) and "upper explosive limit" (UEL).

6.3 Fire Extinguishing Agents – The agents are listed in decreasing order of importance. The general capabilities of all agents are described by G.H. Tryon, "Fire Protection Handbook," 13th ed., National Fire Protection Association, Boston, Mass., 1969.

6.4 Fire Extinguishing Agents Not to be Used – The agents listed must not be used because they react with the chemical and create an additional hazard. In some cases they are listed because they are ineffective in putting out the fire.

6.5 Special Hazards of Combustion Products -- Some chemicals decompose or burn to give off toxic and irritating gases. Such gases may also be given off by chemicals that vaporize in the heat of a fire without either decomposing or burning. If no entry appears, the combustion products are thought to be similar to those formed by the burning of oil, gasoline, or alcohol; they include carbon monoxide (poisonous), carbon dioxide, and water vapor. The specific combustion products are usually not well known over the wide variety of conditions existing in fires; some may be hazardous.

6.6 Behavior in Fire – Any characteristic behavior that might increase significantly the hazard involved in a fire is described. The formation of dense smoke or flammable vapor clouds, and the possibility of polymerization and explosions is stated. Unusual difficulty in extinguishing the fire is also noted.

6.7 Ignition Temperature – This is the minimum temperature at which the material will ignite without a spark or flame being present. Along with the values in 6.1 and 6.2 above, it gives an indication of the relative flammability of the chemical. It is sometimes called the "autoignition temperature." The method of measurement is given in ASTM D-2155.

6.8 Electrical Hazard – The ease with which the chemical is ignited by electrical equipment is indicated by the *Group* and *Class* assignment made in "Fire Codes," Vol. 5, National Fire Protection Association, Boston, Mass., 1972, pp. 70-289. This information is available for relatively few chemicals, so an absence of data does not necessarily mean that the substance is not hazardous in the presence of electrical equipment.

6.9 Burning Rate – The value is the rate (in millimeters per minute) at which the depth of a pool of liquid decreases as the liquid burns. Details of measurement are given by D.S. Burgess, A. Strasser, and J. Grumer, "Diffusive Burning of Liquid Fuels in Open Trays," Fire Research Abstracts and Reviews, 3, 177 (1961).

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water – The term "No reaction" means that no hazard results when the chemical reacts or mixes with water. Where a hazard does result, it is described.

7.2 Reactivity with Common Materials – This is limited to hazardous reactions with fuels and with common materials of construction such as metal, wood, plastics, cement, and glass. The nature of the hazard, such as severe corrosion or formation of a flammable gas, is described.

7.3 Stability During Transport – The term "Stable" means that the chemical will not decompose in a hazardous manner under the conditions of temperature, pressure, and mechanical shock that are normally encountered during shipment; the term does *not* apply to fire situations. Where there is a possibility of hazardous decomposition, an indication of the conditions and the nature of the hazard is given.

7.4 Neutralizing Agents for Acids and Caustics – In all cases involving accidental discharge, dilution with water may be followed by use of the agent specified, particularly if the material cannot be flushed away; the agent specified need not necessarily be used. More detailed information for this kind of response is given in the Response Methods Handbook, CG-446-4.

7.5 Polymerization – A few chemicals can undergo rapid polymerization to form sticky, resinous materials, with the liberation of much heat. The containers may explode. For these chemicals the conditions under which the reaction can occur are given. See Section 13.16 for quantitative data.

7.6 Inhibitor of Polymerization – The chemical names and concentrations of inhibitors added by the manufacturer to prevent polymerization are given.

8. WATER POLLUTION

8.1 Aquatic Toxicity – The form of data presentation used by the Environmental Protection Agency's "Oil and Hazardous Material-Technical Assistance Data System (OHM-TADS)" is used here. Reading from left to right and separated by slashes (/) are the following data:

- Concentration in parts per million by weight (or milligrams per liter) at which the chemical was tested;

- Time of exposure in hours;

- Name of the aquatic species studied;

- Effect observed; LC_{50} means that approximately 50% of the fish will die under the conditions of concentration and time given. TL_m (Median Tolerance Limit) means that approximately 50% of the fish will show abnormal behavior (including death) under the conditions of concentration and time given; the term EC_{50} (Effective Concentration$_{50}$) is used sometimes instead of TL_m;

- The kind of water used in the test (fresh or salt).

Some chemicals have been tested with many species of fish. Where the data were available, the data sheet cites one illustrative test in fresh water and one in salt water.

8.2 Waterfowl Toxicity –Very little information is available. In a few cases there is entered the LD_{50} value, which indicates the dose (in milligrams per kilogram of body weight) that is lethal to about half the waterfowl tested.

8.3 Biological Oxygen Demand (BOD) – Also called "biochemical oxygen demand," this is a standard way of describing how much oxygen dissolved in water is consumed by biological oxidation of the chemical during the stated period of time. The unit *lb/lb* indicates the pounds of oxygen consumed by each pound of chemical during the time stated. When given in *percent,* the values indicate the pounds of oxygen consumed by each 100 pounds of chemical during the time stated. If the percentage is followed by "(theor.)", it indicates the pounds of oxygen theoretically required to completely oxidize 100 pounds of the chemical.

8.4 Food Chain Concentration Potential – If the chemical is consumed by fish, marine plants, waterfowl, etc., that are in turn eaten by other species, the substance may accumulate and ultimately be consumed by humans. Where this occurs, an indication of the potential hazard and its significance is given.

9. SELECTED MANUFACTURERS

Three manufacturers are named wherever possible. When production data for the chemical were available, the manufacturers were selected from among the major producers. The "1972 Directory of Chemical Producers, United States of

America" (Chemical Information Services, Stanford Research Institute, Menlo Park, California) and "Buyers Guide Issue," *Chemical Week,* 111, No. 7, Part Two (October 25, 1972) were the sources used.

10. SHIPPING INFORMATION

10.1 Grades or Purity – The grades USP (United States Pharmacopoeia) and CP (chemically pure) are quite pure. Where "Technical" or "Commercial" grades are given, the percent by weight of the pure chemical present is usually indicated. In a few cases the identity of the major impurities is given. If the properties of the less pure grades differ significantly from those of the pure substance, the differences in properties are described in general terms.

10.2 Storage Temperature – The range of temperatures at which the chemical is normally shipped in bulk by water transport is given. "Ambient" means the temperature of the surroundings.

10.3 Inert Atmosphere – The terms used are "inerted," "padded," "ventilated (forced)," "ventilated (natural)," and "no requirement." They are given when found in the Code of Federal Regulations, Title 46, beginning in Part 151.05.

10.4 Venting – The terms used are "open," "pressure-vacuum," and "safety relief" (same source as 10.3 above).

11. HAZARD ASSESSMENT CODE

The code designates the assessment calculation route to be used in the Hazard Assessment Handbook when evaluating the hazard.

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations – This is the hazard class specified in the Code of Federal Regulations, Title 49, Part 172, December 31, 1976. Chemicals not specifically listed therein have been classified as "Flammable" if their flash point (closed cup) is below 100°F.

12.2 NAS Hazard Rating for Bulk Water Transportation – The indicated ratings are given in "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," National Academy of Sciences, Committee on Hazardous Materials, Washington, D.C., 1972. An outline of the rating system is given in Table 1.

TABLE 1

EXPLANATION OF NAS HAZARD RATINGS

		Health		
Rating	Fire	Vapor Irritant	Liquid or Solid Irritant	Poisons
0	No hazard	No effect	No effect	No effect
1	Flash point (C.C.) above 140°F	Slight effect	Causes skin smarting	Slightly toxic
2	Flash point (C.C.) 100 to 140°F	Moderate irritation; temporary effect	First-degree burns, short exposure	Intermediate toxicity
3	Flash point (C.C.) below 100°F; boiling point above 100°F	Irritating; cannot be tolerated	Second-degree burns, few minutes' exposure	Moderately toxic
4	Flash point (C.C.) below 100°F; boiling point below 100°F	Severe effect; may do permanent injury	Second-degree and third-degree burns	Severely toxic

	Water Pollution		
Rating	Human Toxicity	Aquatic Toxicity	Aesthetic Effect
0	Nontoxic; $LD_{50} > 15$ g/kg	Acute threshold limits above 10,000 ppm	No significant pollution; gases and odorless liquids
1	Practically nontoxic; LD_{50} 5 to 15 g/kg	Threshold limits 1,000 to 10,000 ppm	Mild-odored light oils and soluble chemicals
2	Slightly toxic; LD_{50} 0.5 to 5 g/kg	Threshold limits 100 to 1,000 ppm	Mild-odored, colorless, water-insoluble oils; boiling point 150-450°F
3	Moderately toxic; LD_{50} 50 to 500 mg/kg	Threshold limits 1 to 100 ppm	Light-colored high-boiling oils; odorous water-soluble compounds
4	Toxic; $LD_{50} < 50$ mg/kg	Threshold limits below 1 ppm	Heavy oils, colored or bad odors

TABLE 1 (Continued)

Rating	Reactivity		
	Other Chemicals	Water	Self-reaction
0	Inactive; may be attacked by materials rated 4	No reaction	No reaction
1	React only with materials rated 4	Mild reaction; unlikely to be hazardous	Mild self-reaction under some conditions
2	React with materials rated 3 or 4	Moderate reaction	Will undergo self-reaction if contaminated; do not require stabilizer
3	React with each other and with materials rated 2 or 4	More vigorous reaction; may be hazardous	Vigorous self-reaction; require stabilizer
4	React with each other and materials rated 0-3	Vigorous reaction; likely to be hazardous	Self-oxidizing chemical; capable of explosion or detonation

12.3 NFPA Hazard Classifications – The indicated ratings are given in "Fire Protection Guide on Hazardous Materials," Code 704M, 4th ed., National Fire Protection Association, Boston, Mass., 1972. Changes in the rating that are described in "1973 NFPA Technical Committee Reports, Volume A" are included. The classifications are defined in Table 2 below. The symbol used in conjunction with these ratings is illustrated in Section 4.2.

TABLE 2

EXPLANATION OF NFPA HAZARD CLASSIFICATIONS

Classification Health Hazard (blue)	Definition
4	Materials which on very short exposure could cause death or major residual injury even though prompt medical treatment were given.
3	Materials which on short exposure could cause serious temporary or residual injury even though prompt medical treatment were given.
2	Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
1	Materials which on exposure would cause irritation but only minor residual injury even if no treatment is given.
0	Materials which on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.
Flammability (red)	
4	Materials which will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or which are readily dispersed in air and which will burn readily.
3	Liquids and solids that can be ignited under almost all ambient temperature conditions.
2	Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.

TABLE 2 (Continued)

Classification	Definition
Flammability (red) cont'd	
1	Materials that must be preheated before ignition can occur.
0	Materials that will not burn.
Reactivity (yellow)	
4	Materials which in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.
3	Materials which in themselves are capable of detonation or explosive reaction but require a strong initiating source or which must be heated under confinement before initiation or which react explosively with water.
2	Materials which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. Also materials which may react violently with water or which may form potentially explosive mixtures with water.
1	Materials which in themselves are normally stable, but which can become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not violently.
0	Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.
Other (white)	
~~W~~	Materials which react so violently with water that a possible hazard results when they come in contact with water, as in a fire situation. Similar to Reactivity Classification 2.
Oxy	Oxidizing material; any solid or liquid that readily yields oxygen or other oxidizing gas, or that readily reacts to oxidize combustible materials.

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm – The statement indicates whether the chemical is a solid, liquid, or gas after it has reached equilibrium with its surroundings at "ordinary" conditions of temperature and pressure.

13.2 Molecular Weight – The value given is the weight of a molecule of the chemical relative to a value of 12 for one atom of carbon.

The molecular weight is useful in converting from molecular units to weight units, and in calculating the pressure, volume and temperature relationships for gaseous materials. The ratio of the densities of any two gases is approximately equal to the ratio of their molecular weights (see 13.10).

The molecular weights of mixtures can be calculated if both the identity and quantity of each component of the mixture are known. Because the composition of mixtures described in this manual is not known exactly, or because it varies from one shipment to another, no molecular weights are given for such mixtures.

13.3 Boiling Point at 1 atm – The value is the temperature of a liquid when its vapor pressure is 1 atm. For example, when water is heated to 100°C (212°F) its vapor pressure rises to 1 atm and the liquid boils.

The boiling point at 1 atm indicates whether a liquid will boil and become a gas at any particular temperature and sea-level atmospheric pressure.

13.4 Freezing Point – The freezing point is the temperature at which a liquid changes to a solid. For example, liquid water changes to solid ice at 0°C (32°F). Some liquids solidify very slowly even when cooled below their freezing point. When liquids are not pure (for example, salt water) their freezing points are lowered slightly.

13.5 Critical Temperature – The maximum temperature at which a liquid can exist, no matter what the pressure on it, is called the critical temperature. For example, the critical temperature of water is 372°C (705°F). The value can be used to estimate many properties whose values are not immediately available.

13.6 Critical Pressure – The vapor pressure of a chemical at the critical temperature (see 13.5) is called the critical pressure. For example, the critical pressure of water is 218 atm. Values are given in pounds per square inch absolute, atmospheres, and meganewtons per square meter. The value can be used for estimating many property values that are not immediately available.

13.7 Specific Gravity – The specific gravity of a chemical is the ratio of the weight of the solid or liquid to the weight of an equal volume of water at 4°C (or at some other specified temperature).

If the specific gravity is less than 1.0 (or less than 1.03 in seawater) the chemical will float; if higher, it will sink. Where the change in the value with temperature is important, more data are found in 13.17.

13.8 Liquid Surface Tension – This property is a measure of the tensile force at the surface of a liquid that tends to shape liquid fragments into spherical drops. Values are expressed in dynes per centimeter and newtons per meter. Liquids with high surface tensions show less tendency to spread. Water has a surface tension of about 73 dynes/cm; seawater has a slightly higher value.

13.9 Liquid-Water Interfacial Tension – The value is a measure of the tensile forces existing at the interface between a liquid and water. Approximately, it is the difference between the individual surface tension of the liquid and that of water. Low values of the interfacial tension indicate that the chemical spreads readily on a water surface. The units are the same as in 13.8.

13.10 Vapor (Gas) Specific Gravity – The value is the ratio of the weight of vapor to the weight of an equal volume of dry air at the same conditions of temperature and pressure. Buoyant vapors have a vapor specific gravity less than one. The value may be approximated by the ratio M/29, where M is the molecular weight of the chemical (see 13.2).

In some cases the vapor may be at a temperature different from that of the surrounding air. For example, the vapor from a container of boiling methane at -172°F sinks in warm air, even though the vapor specific gravity of methane at 60°F is about 0.6.

For the effect of temperature on vapor density, see 13.23.

13.11 Ratio of Specific Heats of Vapor (Gas) – This property is the ratio of the specific heat at constant pressure (C_p) to the specific heat at constant volume (C_v); its value is always greater than one. In most cases it was calculated by use of the expression $\frac{C_p}{C_v} = \frac{C_p}{(C_p - R)}$

where R is the Universal Gas Constant.

The ratio varies slightly with temperature; the value given is at 20°C (68°F). The ratio is often of value in estimating temperature changes when gases are compressed or expanded. Higher values of the ratio lead to larger temperature changes for a given pressure change.

13.12 Latent Heat of Vaporization – The value is the heat that must be added to the specified weight of a liquid before it can change to vapor (gas). It varies with temperature; the value given is that at the boiling point at 1 atm (see 13.3). The units used are Btu per pound, calories per gram, and joules per kilogram.

No value is given for chemicals with very high boiling points at 1 atm, because such substances are considered essentially nonvolatile.

13.13 Heat of Combustion – The value is the amount of heat liberated when the specified weight is burned in oxygen at 25°C. The products of combustion, including water, are assumed to remain as gases; the value given is usually referred to as the "lower heat value." The negative sign before the value indicates that heat is given off when the chemical burns. Units are the same as in 13.12.

13.14 Heat of Decomposition – The value is the amount of heat liberated when the specified weight decomposes to more stable substances. The value is given for very few chemicals, because most are stable and do not decompose under the conditions of temperature and pressure encountered during shipment. The negative sign before the value simply indicates that heat is given off during the decomposition. The value does *not* include heat given off when the chemical burns. Units are the same as in 13.13.

13.15 Heat of Solution – The value represents the heat liberated when the specified weight of chemical is dissolved in a relatively large amount of water at 25°C ("infinite dilution"). A negative sign before the value indicates that heat is given off, causing a rise in temperature. (A few chemicals absorb heat when they dissolve, causing the temperature to fall.) Units are the same as in 13.12.

In those few cases where the chemical reacts with water and the reaction products dissolve, the heat given off during the reaction is included in the heat of solution.

13.16 Heat of Polymerization – The value is the heat liberated when the specified weight of the compound (usually called the monomer) polymerizes to form the polymer. In some cases the heat liberated is so great that the temperature rises significantly, and the material may burst its container or

catch fire. The negative sign before the value indicates that heat is given off during the polymerization reaction. Units are the same as in 13.12.

Items 13.17 through 13.24 consist of graphs. The temperature range over which each graph is reliable is indicated by the length of the curve.

13.17 Saturated Liquid Density – The value is the weight (in pounds) of one cubic foot of liquid that is in equilibrium with its vapor. Liquid densities decrease slightly with an increase in temperature; where literature data or reliable estimation methods were applicable, a graph shows this effect.

13.18 Liquid Heat Capacity – The value is the heat (in Btu) required to raise the temperature of one pound of the liquid one degree Fahrenheit at constant pressure. For example, it requires almost 1 Btu to raise the temperature of 1 pound of water from 68°F to 69°F. The value is useful in calculating the increase in temperature of a liquid when it is heated, as in a fire. The value increases slightly with an increase in temperature; the graph shows this effect.

13.19 Liquid Thermal Conductivity – The value is a measure of the ability of a liquid to conduct heat. It represents the number of Btu per hour that pass through an area of liquid one square foot in cross-section when the temperature gradient is 1°F per inch of depth. Higher values indicate that the liquid conducts heat more readily.

Liquid thermal conductivities decrease slightly with an increase in temperature. Where applicable, the graph shows this effect.

A basic law of heat conduction states that the energy flow per unit area per unit time is proportional to the gradient in temperature. The constant of proportionality is the liquid thermal conductivity.

13.20 Liquid Viscosity – The value (in centipoise) is a measure of the ability of a liquid to flow through a pipe or a hole; higher values indicate that the liquid flows less readily under a fixed pressure head. For example, heavy oils have higher viscosities (i.e., are more viscous) than gasoline.

Liquid viscosities decrease rapidly with an increase in temperature. In some cases a graph is given to show the effect. In other cases only a single data point was found in the literature.

A basic law of fluid mechanics states that the force per unit area needed to shear a fluid is proportional to the velocity gradient. The constant of proportionality is the viscosity.

13.21 Solubility in Water – The value represents the pounds of a chemical that will dissolve in 100 pounds of pure water. Solubility usually increases when the temperature increases; where the change has been measured, a graph is given to show the effect. The following terms are used when numerical data are either unavailable or not applicable:

The term "Miscible" means that the chemical mixes with water in all proportions. The term "Reacts" means that the substance reacts chemically with water; thus, its solubility has no real meaning. "Insoluble" usually means that one pound of the chemical does not dissolve entirely in 100 pounds of water. (Weak solutions of "Insoluble" materials may still be hazardous to humans, fish, and waterfowl, however.)

13.22 Saturated Vapor Pressure – The value is the pressure (in pounds per square inch absolute) of the vapor in equilibrium with the liquid form at the specified temperature. Vapor pressure values can be used to estimate the relative volatility of chemicals at a given temperature, and to calculate the pressure over a liquid that is shipped in a closed container.

The vapor pressure increases as temperature increases; a graph is given to show this effect. Note that the vapor pressure scale is logarithmic.

13.23 Saturated Vapor Density – The value is the weight (in pounds) of one cubic foot of vapor that is in equilibrium with the liquid form.

If it is assumed that the vapor behaves as an ideal gas, the relation pM/RT holds, where p is the vapor pressure, M is the molecular weight, R is the gas constant, and T is the temperature (in absolute units).

Since the vapor pressure varies with temperature (see 13.22), the saturated vapor density also varies with temperature, as shown on the graph. Note that the density scale is logarithmic.

13.24 Ideal Gas Heat Capacity – The value is the number of Btu needed to raise the temperature of one pound of gas by 1° Fahrenheit. The property can be used only when the pressure of the gas is less than about 10 atm. The ideal gas heat capacity is not a function of pressure (below about 10 atm), but it does increase with temperature, and a graph is given to show the effect.

4. OTHER INFORMATION SYSTEMS

4.1 CHEMICAL TRANSPORTATION EMERGENCY CENTER (CHEMTREC)

The Manufacturing Chemists Association operates CHEMTREC 24 hours a day. By calling the appropriate toll-free number listed below, one can consult experts on chemicals and spill response.

Continental United States (except Alaska & District of Columbia)	800-424-9300
Alaska, Hawaii, and District of Columbia	202-483-7616

4.2 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

The NFPA's "Recommended System for the Identification of the Fire Hazards of Materials" (NFPA No. 704M) provides basic warning information to fire fighters in industrial plants and storage facilities. This system uses a diamond-shaped warning symbol (Figure 4.1). The top, left, and right boxes refer to flammability, health, and reactivity hazards respectively and contain a number from 0 to 4. The exact meaning of each number is explained in Section 3 (¶ 12.3) of this manual, and the applicable numbers for each chemical are listed in Section 11 under "NFPA Hazard Classifications." The bottom box is used for special hazards; the most common of these is a warning against the use of water. indicated by the symbol W.

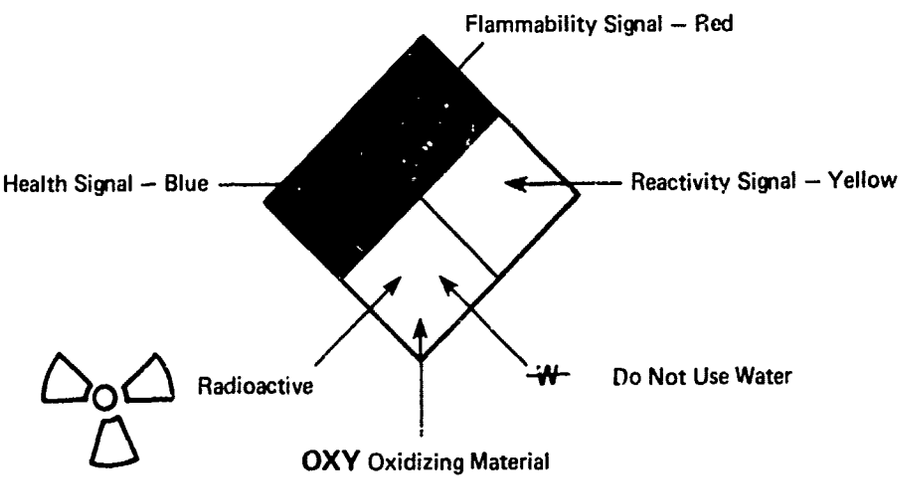


FIGURE 4.1 NFPA 704M SYMBOL

4.3 INTERNATIONAL MARITIME CONSULTATIVE ORGANIZATION (IMCO)

Foreign vessels using U.S. waterways generally utilize, in addition to U.S. requirements, an international labeling system developed by IMCO. This system consists of 15 diamond-shaped labels (Figure 4.2). Each identifies a particular hazard by a descriptive picture, a word, and a distinctive color.

The number at the bottom of each diamond identifies the class to which IMCO has assigned the chemical and is the same as the first digit in the IMCO/UN numerical designation, one of the items given under "Chemical Designations" in Section 11 of this manual.

4.4 DEPARTMENT OF TRANSPORTATION (DOT)

At the time this manual was in preparation, a Hazard Information (HI) System had been proposed by the Department of Transportation – Hazardous Materials Regulation Board. It uses IMCO-type warning labels with a number between 1 and 89 added at the bottom of the diamond. This number refers to the section number in a guide containing general hazard and response information for 89 categories of chemicals. The information is similar to that provided in this manual, except that it does not consider water pollution. At the time of publication of this manual, the HI System had not yet been adopted.

4.5 NATIONAL ACADEMY OF SCIENCES (NAS)

A booklet entitled "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals – A Tentative Guide" was prepared for the USCG by the Committee on Hazardous Materials of the National Academy of Sciences, National Research Council. It rates the fire, health, water pollution, and radioactivity hazards of over 200 chemicals on a scale of 0 to 4; the meaning of each number is explained in Section 3 of this manual, and the applicable numbers for each chemical are listed in Section 11 under "NAS Hazard Rating for Bulk Water Transportation." No response guidance is provided.

4.6 OHM-TADS (EPA)

The Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) has been developed by the Environmental Protection Agency (EPA) to provide information on physical and chemical properties, hazards, pollution characteristics, and shipping information for over 800 hazardous materials. OHM-TADS consists of a computerized data base which can be accessed from terminals at the 10 EPA Regional Offices and from EPA Headquarters in Washington, D.C. The System can provide either information on specifically requested properties for a material, or it can print all the information in its files for that material.

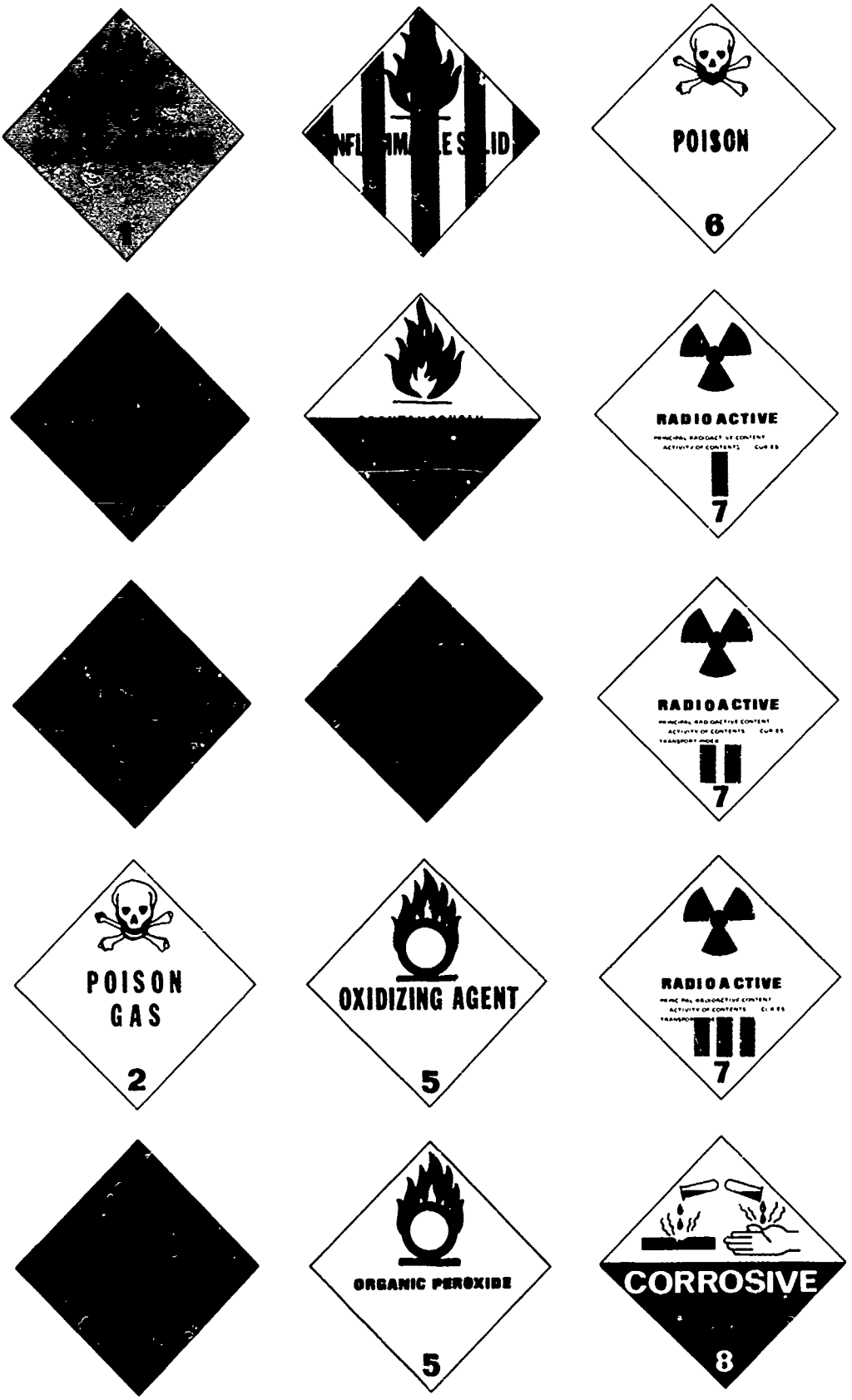


FIGURE 4-2
IMCO SHIPPING LABELS

Some of the same information appears in both this manual and OHM-TADS, but each contains some information not found in the other.

4.7 POISON CONTROL CENTERS

Throughout the country, local Poison Control Centers are maintained at hospitals. These Centers can provide information on the chemical composition, appearance, and toxicity of common poisonous materials as well as information on the symptoms of exposure and on the emergency procedures recommended in the event of exposure. The information available at these centers deals mainly with common household materials.

Poison Control Centers are coordinated through the Department of Health, Education and Welfare in Washington, D.C., but information should be requested through the local centers.

The telephone number of the local Poison Control Center can be found in a local telephone directory or in the Regional Contingency Plan.

5. CONVERSION FACTORS

To Convert	To	Multiply by
Length		
inches	millimeters	25.4*
inches	feet	0.0833
feet	inches	12*
feet	meters	0.3048*
feet	yards	0.3333
feet	miles (U.S. statute)	0.0001894
yards	feet	3*
yards	miles (U.S. statute)	0.0005682
miles (U.S. statute)	feet	5280*
miles (U S. statute)	yards	1760*
miles (U.S. statute)	meters	1609
miles (U.S. statute)	nautical miles	0.868
meters	feet	3.231
meters	yards	1.094
meters	miles (U.S. statute)	0.0006214
nautical miles	miles (U.S. statute)	1.152
Area		
square inches	square centimeters	6.452
square inches	square feet	0.006944
square feet	square inches	144*
square feet	square meters	0.09290
square meters	square feet	10.76
square miles	square yards	3,097,600*
square yards	square feet	9*
Volume		
cubic inches	cubic centimeters	16.39
cubic inches	cubic feet	0.0005787
cubic feet	cubic inches	1728*
cubic feet	cubic meters	0.02832
cubic feet	U.S. gallons	7.481
cubic meters	cubic feet	35.31
liters	quarts (U.S. liquid)	1.057
quarts (U.S. liquid)	liters	0.9463
U.S. gallons	barrels (petroleum)	0.02381
U.S. gallons	cubic feet	0.1337
U.S. gallons	Imperial gallons	0.8327
barrels (petroleum)	U.S. gallons	42*
Imperial gallons	U.S. gallons	1.201
milliliters	cubic centimeters	1*

*Exact value

To Convert	To	Multiply by
Time		
seconds	minutes	0.01667
seconds	hours	0.0002778
seconds	days	0.00001157
minutes	seconds	60*
minutes	hours	0.01667
minutes	days	0.0006944
hours	seconds	3600*
hours	minutes	60*
hours	days	0.04167
Mass or Weight		
pounds	kilograms	0.4536
pounds	short tons	0.0005*
pounds	long tons	0.0004464
pounds	metric tons	0.0004536
tons (short)	pounds	2000*
tons (metric)	pounds	2205
tons (long)	pounds	2240*
kilograms	pounds	2.205
tonnes (metric tons)	kilograms	1000*
Energy		
calories	Btu	0.003968
calories	joules	4.187
Btu (British thermal units)	calories	252.0
Btu	joules	1055
joules	calories	0.2388
joules	Btu	0.0009479
Velocity		
feet per second	meters per second	0.3048
feet per second	miles per hour	0.6818
feet per second	knots	0.5921
meters per second	feet per second	3.281
meters per second	miles per hour	2.237
miles per hour	meters per second	0.4470
miles per hour	feet per second	1.467
knots	meters per second	0.5148
knots	miles per hour	1.151
knots	feet per second	1.689
Density		
pounds per cubic foot	grams per cubic centimeter	0.01602
grams per cubic centimeter	pounds per cubic foot	62.42
grams per cubic centimeter	kilograms per cubic meter	1000*
kilograms per cubic meter	grams per cubic centimeter	0.001

*Exact value

To Convert	To	Multiply by
Pressure		
pounds per square inch (absolute)(psia)	kilonewtons per square meter (kN/m^2)	6.895
psia	atmospheres	0.0680
psia	inches of water	27.67
psia	millimeters of mercury (torr)	51.72
pounds per square inch (gauge) (psig)	psia	add 14.70
millimeters of mercury (torr)	psia	0.01934
millimeters of mercury (torr)	kN/m^2	0.133
inches of water	psia	0.03614
kilograms per square centimeter	millimeters of mercury (torr)	735.6
inches of water	kN/m^2	0.2491
kilograms per square centimeter	atmospheres	0.9678
atmospheres	kN/m^2	101.3
kilograms per square centimeter	psia	14.22
atmospheres	psia	14.70
bars	kN/m^2	100*
kilonewtons per square meter (kN/m^2)	psia	0.1450
bars	atmospheres	0.9869
kilonewtons per square meter (kN/m^2)	atmospheres	0.009869
bars	kilograms per square centimeter	1.020
Viscosity		
centipoises	pounds per foot per second	0.0006720
pounds per foot per second	centipoises	1488
centipoises	poises	0.01*
centipoises	newton seconds per square meter	0.001*
poises	grams per centimeter per second	1*
grams per centimeter per second	poises	1*
newton seconds per square meter	centipoises	1000*
Thermal Conductivity		
Btu per hour per foot per °F	watts per meter-kelvin	1.731
Btu per hour per foot per °F	kilocalories per hour per meter per °C	1.488
watts per meter-kelvin	Btu per hour per foot per °F	0.5778
kilocalories per hour per meter per °C	watts per meter-kelvin	1.163
kilocalories per hour per meter per °C	Btu per hour per foot per °F	0.6720
Heat Capacity		
Btu per pound per °F	calories per gram per °C	1*
Btu per pound per °F	joules per kilogram-kelvin	4187
joules per kilogram-kelvin	Btu per pound per °F	0.0002388
calories per gram per °C	Btu per pound per °F	1*
Concentration (in water solution)		
parts per million (ppm)	milligrams per liter	1*
milligrams per liter	ppm	1*
milligrams per cubic meter	grams per cubic centimeter	1×10^{-9}
grams per cubic centimeter	milligrams per cubic meter	1×10^{9}

*Exact value

To Convert	To	Multiply by
Concentration (in water solution) (Continued)		
grams per cubic centimeter	pounds per cubic foot	62.42
pounds per cubic foot	grams per cubic centimeter	0.01602
Temperature		
degrees Kelvin (°K)	degrees Rankine (°R)	1.8*
degrees Rankine (°R)	degrees Kelvin (°K)	0.5556
degrees centigrade (°C)	degrees Fahrenheit (°F)	First multiply by 1.8, then add 32
degrees Fahrenheit (°F)	degrees centigrade (°C)	First subtract 32, then multiply by 0.5556
degrees centigrade (°C)	degrees Kelvin (°K)	add 273.2
degrees Fahrenheit (°F)	degrees Rankine (°R)	add 459.7
Flow		
cubic feet per second	U.S. gallons per minute	448.9
U.S. gallons per minute	cubic feet per second	0.002228

Universal Gas Constant (R)

8.314 joules per gram mole-kelvin
1.987 calories per gram mole-kelvin
1.987 Btu per pound mole per °F
10.73 psia-cubic feet per pound mole per °F
82.057 atm-cubic centimeters per gram mole-kelvin
62.361 millimeters mercury liter per gram mole-kelvin

*Exact value

6. SELECTED PROPERTIES OF FRESH WATER, SEA WATER, ICE, AND AIR

The following properties are useful for engineering calculations described in the Hazard Assessment Handbook. The values for *fresh water* are those recorded for pure water. The values for the water of lakes and streams differ somewhat from those of pure water, but since no "standard" fresh water has ever been defined, the values for pure water must be used.

A "standard" *sea water* has been defined as one containing 35 grams of salts per kilogram of solution. The values for the water of tidal estuaries differ somewhat from those of "standard" sea water because the water has a salinity somewhere between those of fresh and sea waters.

The value for the density of *air* was derived from the ideal gas law: the air is assumed to be dry and at 1 atmosphere pressure.

6.1 FREEZING POINT

Fresh Water	0°C	32°F
Sea Water	−1.91°C	28.6°F

6.2 LATENT HEAT OF FUSION OF ICE

79.6 cal/g = 143.3 Btu/lb

6.3 DENSITY (See Figures 6.1, 6.2, and 6.3)

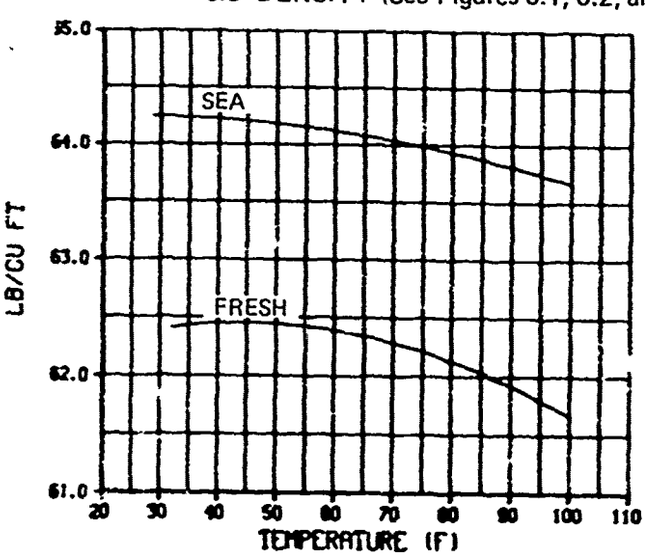


FIGURE 6.1 DENSITY OF WATER

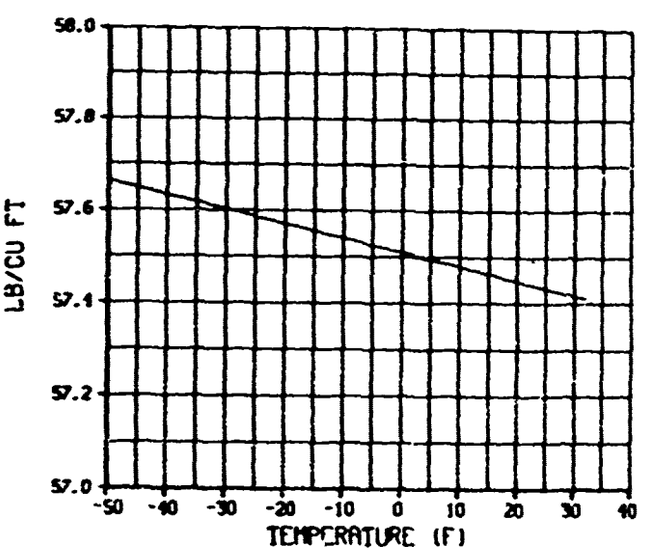


FIGURE 6.2 DENSITY OF ICE

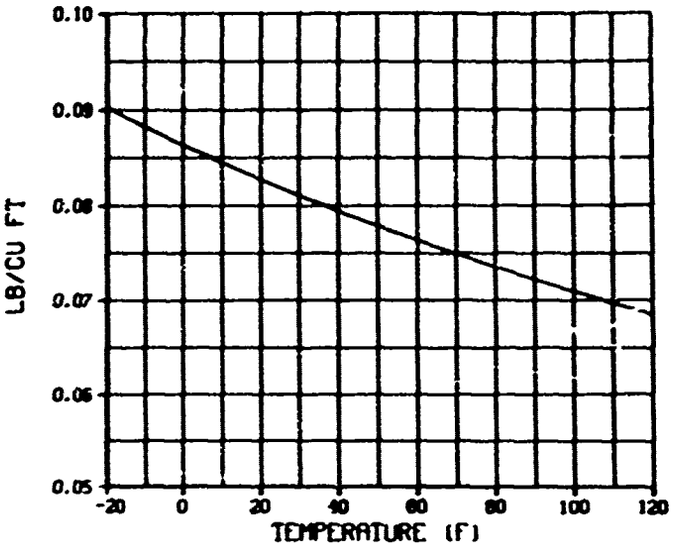


FIGURE 6.3 DENSITY OF DRY AIR (1 atm.)

6.4 VISCOSITY (See Figure 6.4)

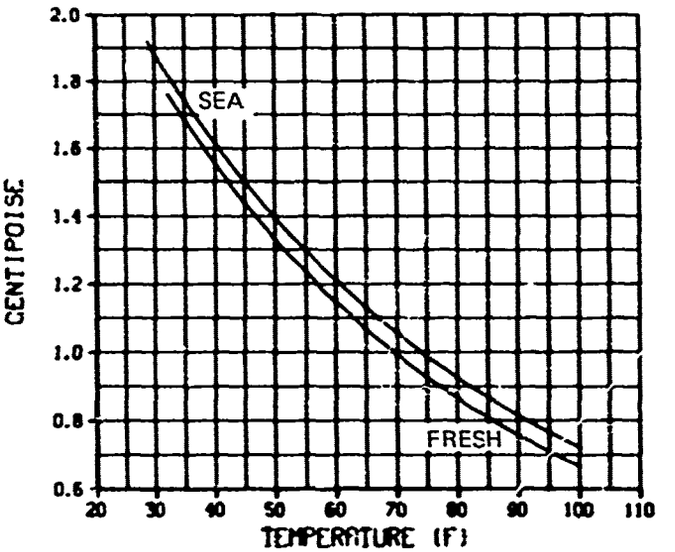


FIGURE 6.4 VISCOSITY OF WATER

6.5 HEAT CAPACITY (See Figures 6.5 and 6.6)

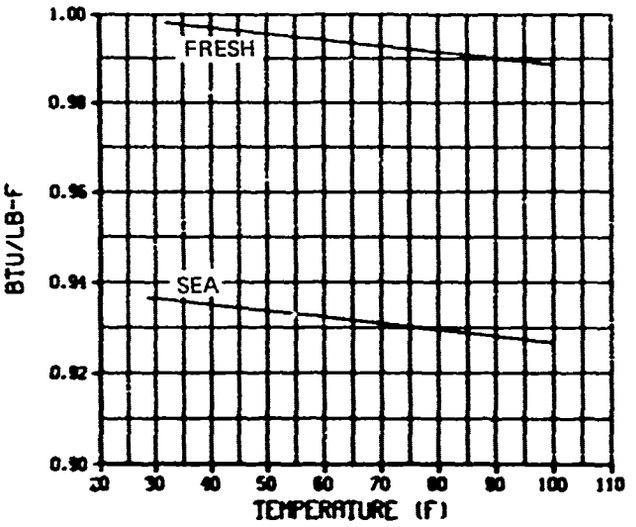


FIGURE 6.5 HEAT CAPACITY OF WATER

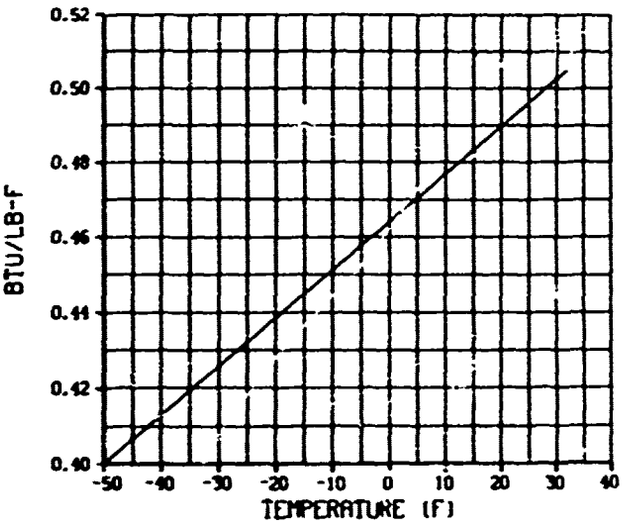


FIGURE 6.6 HEAT CAPACITY OF ICE

6.6 THERMAL CONDUCTIVITY (See Figures 6.7 and 6.8)

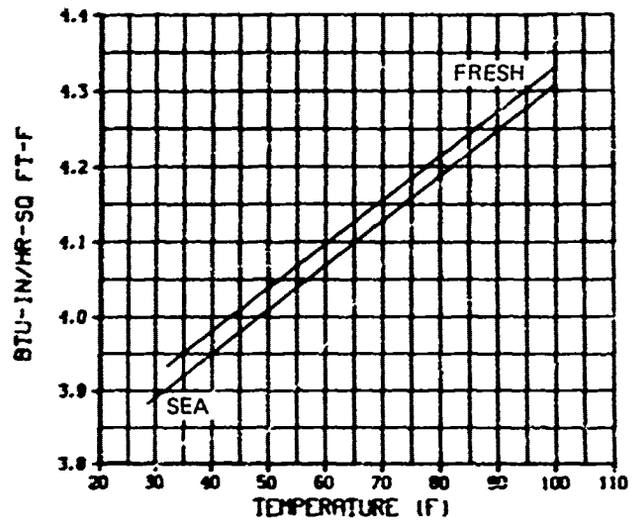


FIGURE 6.7 THERMAL CONDUCTIVITY OF WATER

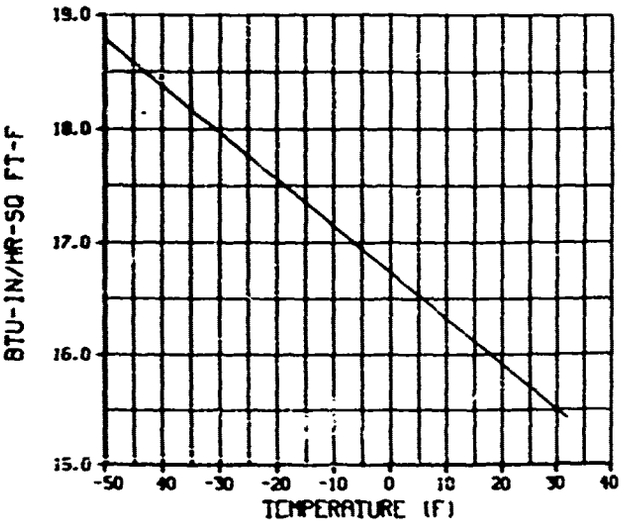


FIGURE 6.8 THERMAL CONDUCTIVITY OF ICE

6.7 VAPOR PRESSURE (See Figures 6.9 and 6.10)

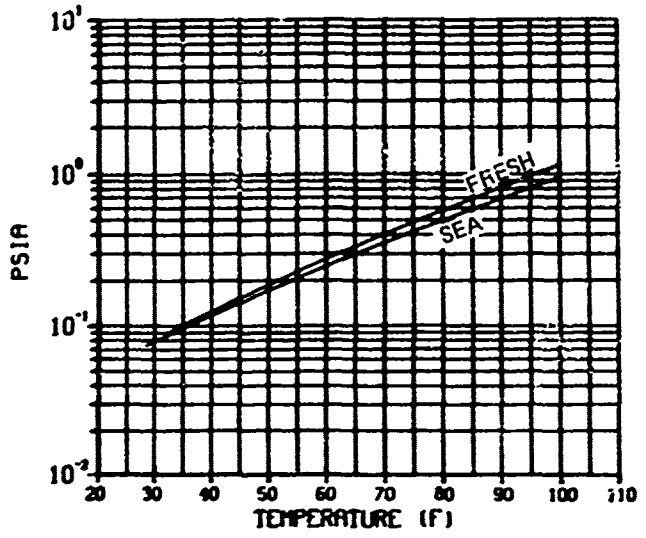


FIGURE 6.9 SATURATED VAPOR PRESSURE OF WATER

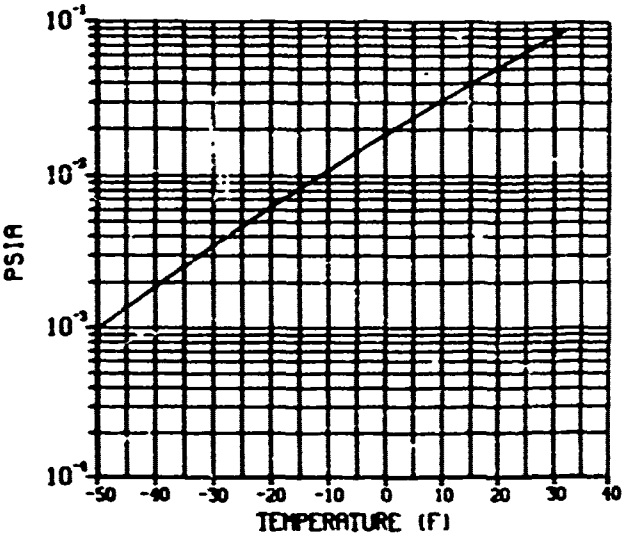


FIGURE 6.10 SATURATED VAPOR PRESSURE OF ICE

7. GUIDE TO COMPATIBILITY OF CHEMICALS

The Guide is based in part upon information provided to the Coast Guard by the National Academy of Sciences – U.S. Coast Guard Advisory Committee on Hazardous Materials and represents the latest information available to the Coast Guard on chemical compatibility.

The accidental mixing of one chemical cargo with another can in some cases be expected to result in a vigorous and hazardous chemical reaction. The generation of toxic gases, the heating, overflow, and rupture of cargo tanks, and fire and explosion are possible consequences of such reactions.

The purpose of the Compatibility Chart is to show chemical combinations believed to be dangerously reactive in the case of accidental mixing. It should be recognized, however, that the Chart provides a broad grouping of chemicals with an extensive variety of possible binary combinations. Although one group, generally speaking, can be considered dangerously reactive with another group where an "X" appears on the Chart, there may exist between the groups some combinations which would not dangerously react. The Chart should therefore not be used as an infallible guide. It is offered as an aid in the safe loading of bulk chemical cargoes, with the recommendation that proper safeguards be taken to avoid accidental mixing of binary mixtures for which an "X" appears on the Chart. Proper safeguards would include consideration of such factors as avoidance of the use of common cargo and vent lines and carriage in adjacent tanks having a common bulkhead.

The following procedure explains how the Guide should be used in determining compatibility information:

(1) Determine the reactivity group of a particular product by referring to the alphabetical list in Table 7.1.

(2) Enter the Chart with the reactivity group. Proceed across the page. An "X" indicates a reactivity group that forms an unsafe combination with the product in question.

For example, crotonaldehyde is listed in Table 7.1 as belonging in Group 19 (Aldehydes). The Chart shows that chemicals in this group should be segregated from sulfuric and nitric acids, caustics, ammonia, and all types of amines (aliphatic, alkanol, and aromatic). According to note A, crotonaldehyde is also incompatible with non-oxidizing mineral acids.

It is recognized there are wide variations in the reaction rates of individual chemicals within the broad groupings shown reactive by the Compatibility Chart. Some individual materials in one group will react violently with some of the materials in another group and cause great hazard; others will react slowly, or not at all. Accordingly, a useful addition to the Guide would be the identification of specific binary combinations which are found *not* to be dangerously reactive, even though an "X" appears on the chart for those two chemicals. A few such combinations are listed in Table 7.3; other safe combinations will be listed in subsequent revisions.

COMPATIBILITY CHART

CARGO GROUPS / REACTIVE GROUPS	1 NON OXIDIZING MINERAL ACIDS	2 SULFURIC ACID	3 NITRIC ACID	4 ORGANIC ACIDS	5 CAUSTICS	6 AMMONIA	7 ALIPHATIC AMINES	8 ALKANOLAMINES	9 AROMATIC AMINES	10 AMIDES	11 ORGANIC ANHYDRIDES	12 ISOCYANATES	13 VINYL ACETATE	14 ACRYLATES	15 SUBSTITUTED ALLYLS	16 ALKYLENE OXIDES	17 EPICHLOROHYDRIN	18 KETONES	19 ALDEHYDES	20 ALCOHOLS, GLYCOLS	21 PHENOLS, CRESOLS	22 CAPROLACTAM SOLUTION	
1 NON OXIDIZING MINERAL ACIDS		X			X	X	X	X	X	X	X	X	X			X	X		A	E			1
2 SULFURIC ACID	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	2
3 NITRIC ACID		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	F	X		3
4 ORGANIC ACIDS		X			X	X	X	X	C			X				X	X			X			4
5 CAUSTICS	X	X	X	X							X	X				X	X		X	X	X	X	5
6 AMMONIA	X	X	X	X						X	X	X	X	X	X	X	X	X	X	X	X	X	6
7 ALIPHATIC AMINES	X	X	X	X							X	X	X	X	X	X	X	B	X				7
8 ALKANOLAMINES	X	X	X	C							X	X							X				8
9 AROMATIC AMINES	X	X	X			X						X									X		9
10 AMIDES	X	X	X		X	X	X	X	X						D					X		X	10
11 ORGANIC ANHYDRIDES	X	X	X	X	X	X	X	X	X	X													11
12 ISOCYANATES	X	X	X			X	X	X				D											12
13 VINYL ACETATE	X	X	X				X	X															13
14 ACRYLATES		X	X				X	X															14
15 SUBSTITUTED ALLYLS		X	X				X	X				D											15
16 ALKYLENE OXIDES	X	X	X	X	X	X	X	X															16
17 EPICHLOROHYDRIN	X	X	X	X	X	X	X	X															17
18 KETONES		X	X				X	B															18
19 ALDEHYDES	A	X	X		X	X	X	X	X														19
20 ALCOHOLS, GLYCOLS	E	X	X	F	X		X					X											20
21. PHENOLS, CRESOLS		X	X		X		X			X													21
22. CAPROLACTAM SOLUTION		X			X		X					X											22
30 OLEFINS		X	X																				30
31. PARAFFINS																							31
32. AROMATIC HYDROCARBONS			X																				32
33. MISCELLANEOUS HYDROCARBON MIXTURES			X																				33
34 ESTERS		X	X																			X	34
35 VINYL HALIDES			X																				35
36. HALOGENATED HYDROCARBONS		G			H		I																36
37 NITRILES		X																					37
38. CARBON DISULFIDE							X	X															38
39. SULFOLANE																							39
40. GLYCOL ETHERS		X										X											40
41. ETHERS		X	X																				41
42 NITROCOMPOUNDS					X	X	X	X	X														42
43. MISCELLANEOUS WATER SOLUTIONS		X										X											43
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

(Letters refer to notes on following page)

NOTE. . COMPATIBILITY CHART: REACTIVITY DIFFERENCE (DEVIATIONS) WITHIN CHEMICAL GROUPS

A Acrolein (19), Crotonaldehyde (19), and 2-Ethyl-3-propyl acrolein (19) are not compatible with Group 1, Non-Oxidizing Mineral Acids.

B Isophorone (18), and Mesityl Oxide (18) are not compatible with Group 8, Alkanolamines.

C Acrylic Acid (4) is not compatible with Group 9, Aromatic Amines.

D Allyl Alcohol (15) is not compatible with Group 12, Isocyanates.

E Furfuryl Alcohol (20) is not compatible with Group 1, Non-oxidizing Mineral Acids.

F Furfuryl Alcohol (20) is not compatible with Group 4, Organic Acids.

G Dichloroethyl Ether (36) is not compatible with Group 2, Sulfuric Acid.

H Trichloroethylene (36) is not compatible with Group 5, Caustics.

I Ethylenediamine (7) is not compatible with Ethylene Dichloride (36).

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS

Name	Group No.
Acetaldehyde	19
Acetic Acid	4
Acetic Anhydride	11
Acetone	18
Acetonitrile	37
Acrolein (inhibited)	19
Acrylic Acid (inhibited)	4
Acrylonitrile (inhibited)	15
Adiponitrile	37
Allyl Alcohol	15
Allyl Chloride	15
Aminoethylethanolamine	8
Ammonia, Anhydrous	6
Ammonium Hydroxide (28% or less)	6
Ammonium Nitrate, Urea, Water Solutions (containing Ammonia)	6
Ammonium Nitrate, Urea, Water Solutions (not containing Ammonia)	43
Amyl Acetate	34
Amyl Alcohol	20
Amyl Tallate	34
Aniline	9
Asphalt	33
Asphalt Blending Stocks:	
Roofers Flux	33
Straight Run Residue	33
Benzene	32
Benzene, Toluene Xylene (crude)	32
Butadiene (inhibited)	30
Butane	31
Butyl Acrylate (inhibited)	14
Butyl Acetate	34
Butyl Alcohol	20
Butylamine	7
Butyl Benzyl Phthalate	34
Butylene	30
1,3-Butylene Glycol	20
Butylene Oxide	16
Butyl Ether	41
Butyl Methacrylate (inhibited)	14
Butyraldehyde	19
Butyric Acid	4
Camphor Oil (light)	18
Caprolactam Solution	22
Carbolic Oil	21
Carbon Disulfide	38
Carbon Tetrachloride	36
Caustic Potash Solution	5
Caustic Soda Solution	5
Chlorine	*
Chlorobenzene	36
Chloroform	36
Chlorosulfonic Acid	*
Corn Syrup	43
Creosote, Coal Tar	21
Cresols	21
Cresylate Spent Caustic Solution	5
Crotonaldehyde	19
Cumene	32
Cycloaliphatic Resins	31
Cyclohexane	31
Cyclohexanol	20
Cyclohexanone	18
Cyclohexylamine	7
Cymene	32
Decaldehyde	19
Decane	31
Decene	30
Decyl Alcohol	20
Decyl Acrylate (inhibited)	14

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Decylbenzene	32
Dextrose Solution	43
Diacetone Alcohol	20
Dibutylamine	7
Dibutyl Phthalate	34
Dichlorobenzene	36
Dichlorodifluoromethane	36
1,1-Dichloroethane	36
Dichloroethyl Ether	41
Dichloromethane	36
1,1-Dichloropropane	36
1,2-Dichloropropane	36
1,3-Dichloropropene	15
Dicyclopentadiene	30
Diethanolamine	8
Diethylamine	7
Diethylbenzene	32
Diethylene Glycol	40
Diethylene Glycol Monobutyl Ether	40
Diethylene Glycol Monobutyl Ether Acetate	34
Diethylene Glycol Monoethyl Ether	40
Diethylene Glycol Monomethyl Ether	40
Diethylenetriamine	7
Diethylethanolamine	8
Diheptyl Phthalate	34
Diisobutylene	30
Diisobutyl Carbinol	20
Diisobutyl Ketone	18
Diisodecyl Phthalate	34
Diisopropanolamine	8
Diisopropylamine	7
Dimethylamine	7
Dimethylethanolamine	8
Dimethylformamide	10
Dinonyl Phthalate	34
Dioctyl Phthalate	34
1,4-Dioxane	41
Diphenyl-Diphenyl Oxide	33
Diphenylmethane Diisocyanate	12
Di-n-propylamine	7
Dipropylene Glycol	40
Distillates:	
Straight Run	33
Flashed Feed Stocks	33
Diundecyl Phthalate	34
Dodecane	31
Dodecanol	20
Dodecene	30
Dodecylbenzene	32
Epichlorohydrin	17
Ethane	31
Ethanolamine	8
Ethoxylated Alcohols C_{11}-C_{15}	40
Ethoxy Triglycol	40
Ethyl Acetate	34
Ethyl Alcohol	20
Ethyl Acrylate (inhibited)	14
Ethylamine	7
Ethyl Benzene	32
Ethyl Butanol	20
Ethyl Chloride	36
Ethylene	30
Ethylene Chlorohydrin	20
Ethylene Cyanohydrin	20
Ethylenediamine	7
Ethylene Dibromide	36
Ethylene Dichloride	36
Ethylene Glycol	20
Ethylene Glycol Monobutyl Ether	40
Ethylene Glycol Monobutyl Ether Acetate	34
Ethylene Glycol Monoethyl Ether	40
Ethylene Glycol Monoethyl Ether Acetate	34
Ethylene Glycol Monomethyl Ether	40
Ethylene Oxide	*
Ethyl Ether	41
Ethylhexaldehyde	19
2-Ethyl Hexanol	20
2-Ethylhexyl Acrylate (inhibited)	14

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Ethyl Hexyl Tallate	34
Ethyl Methacrylate (inhibited)	14
2-Ethyl-3-Propyl Acrolein	19
Formaldehyde Solution (37-50%)	19
Formic Acid	4
Furfural	19
Furfuryl Alcohol	20
Gas Oil:	
Cracked	33
Gasoline Blending Stocks:	
Alkylates	33
Reformates	33
Gasolines:	
Casinghead (natural)	33
Automotive (containing over 4.23 grams lead per gallon)	33
Aviation (containing not over 4.86 grams lead per gallon)	33
Polymer	33
Straight Run	33
Glutaraldehyde Solution	19
Glycerine	20
Glycol Diacetate	34
Glyoxal Solution	19
Heptane	31
Hexamethyleneimine	7
Hexane	31
Hexanol	20
Hexene	30
Hexylene Glycol	20
Hydrochloric Acid	1
Hydrofluoric Acid	1
Isophorone	18
Isoprene (inhibited)	30
Jet Fuels:	
JP-1 (Kerosene)	33
JP-3	33
JP-4	33
JP-5 (Kerosene, Heavy)	33
Kerosene	33
Latex, Liquid Synthetic	43
Mesityl Oxide	18
Methane	31
Methyl Acetate	34
Methyl Acetylene, Propadiene Mixture (Stabilized)	30
Methyl Acrylate (inhibited)	14
Methyl Alcohol	20
Methyl Amyl Acetate	34
Methyl Amyl Alcohol	20
Methyl Bromide	36
3-Methyl Butyraldehyde	19
Methyl Chloride	36
Methyl Ethyl Ketone	18
2-Methyl-5-Ethyl Pyridine	9
Methyl Formal (Dimethyl Formal)	41
Methyl Isobutyl Ketone	18
Methyl Isobutyl Carbinol	20
Methyl Methacrylate (inhibited)	14
(alpha-) Methyl Styrene (inhibited)	30
Mineral Spirits	33
Monochlorodifluoromethane	36
Morpholine	7
Motor Fuel Antiknock Compounds Containing Lead Alkyls	*

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Naphtha:	
Coal Tar	33
Solvent	33
Stoddard Solvent	33
Varnish Markers' and Painters' (75%)	33
Naphthalene (molten)	32
Nitric Acid (70% or less)	3
Nitric Acid (95%)	*
Nitrobenzene	43
1- or 2-Nitropropane	43
Nitrotoluene	43
Nonane	31
Nonene	30
Nonyl Alcohol	20
Nonyl Phenol	21
Nonyl Phenol (ethoxylated)	40
Octane	31
Octene	30
Octyl Alcohol	20
Octyl Aldehyde	19
Octyl Epoxytallate	34
Oils:	
Clarified	33
Coal Oil	33
Crude Oil	33
Diesel Oil	33
Fuel Oils:	
No. 1 (Kerosene)	33
No. 1-D	33
No. 2	33
No. 2-D	33
No. 4	33
No. 5	33
No. 6	33
Residual	33
Road	33
Transformer	33
Edible Oils, including:	
Castor	34
Coconut	34
Cotton Seed	34
Fish	34
Lard	34
Olive	34
Palm	34
Peanut	34
Safflower	34
Soya Bean	34
Tucum	34
Vegetable	34
Miscellaneous Oils, including:	
Absorption	33
Aromatic	33
Coal Tar	33
Heartcut Distillate	33
Linseed	33
Lubricating	33
Mineral	33
Mineral Seal	33
Motor	33
Neatsfoot	33
Penetrating	33
Range	33
Resin	33
Resinous Petroleum	33
Rosin	33
Sperm	33
Spindle	33
Spray	33
Tall	34
Tanner's	33
Turbine	33
Oleum	*
Pentadecanol	22
Pentane	31
Pentene	30
Pentyl Aldehyde	19
Perchloroethylene	36
Petrolatum	33
Petroleum Naphtha	33
Phenol	21
Pentachloroethane	36
Phosphoric Acid	1
Phosphorus	*
Phthalic Anhydride (molten)	11

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Polybutene	30
Polyethylene Glycols	40
Polymethylene Polyphenyl-isocyanate	12
Polypropylene	30
Polypropylene Glycol Methyl Ether	40
Polypropylene Glycols	40
Propane	31
Propanolamine	8
Propionaldehyde	19
Propionic Acid	4
Propionic Anhydride	11
Propyl Acetate	34
Propyl Alcohol	20
Propylamine	7
Propylene	30
Propylene Butylene Polymer	30
Propylene Glycol	20
Propylene Oxide	16
Propylene Tetramer	30
Propyl Ether	41
Pyridine	9
Sodium Hydrosulfide Solution (45% or less)	5
Sorbitol	20
Styrene (inhibited)	30
Sulfolane	39
Sulfur (molten)	*
Sulfuric Acid	2
Sulfuric Acid, Spent	2
Tallow	34
Tallow Fatty Alcohol	20
1,1,2,2-Tetrachloro-ethane	36
Tetradecanol	20
Tetradecene	30
Tetradecylbenzene	32
Tetraethylene Glycol	40
Tetraethylenepentamine	7
Tetrahydrofuran	41
Tetrahydronaphthalene	32
Tetrasodium Salt of EDTA Solution	43
Toluene	32
Toluene Diisocyanate	12
1,2,4-Trichlorobenzene	36
Trichloroethylene	36
Tridecanol	20
Tridecene	30
Tridecylbenzene	32
Triethanolamine	8
Triethylamine	7
Triethyl Benzene	32
Triethylene Glycol	40
Triethylenetetramine	7
Tripropylene Glycol	40
Turpentine	30
Undecanol	20
Undecene	30
Undecylbenzene	32
Valeraldehyde	19
Vinyl Acetate (inhibited)	13
Vinyl Chloride (inhibited)	35
Vinylidene Chloride (inhibited)	35
Vinyl Toluene (inhibited)	30
Xylene	32

* Because of very high reactivity or unusual conditions of carriage, this product is not included in the Compatibility Chart. If compatibility information is needed for a shipment, contact Commandant (G-MHM-1/83), U.S. Coast Guard, 400 Seventh Street, S.W., Washington, D. C. 20590.

TABLE 7.2

REACTIVITY GROUPS

1. Non-Oxidizing Mineral Acids

Hydrochloric Acid
Hydrofluoric Acid
Phosphoric Acid

2. Sulfuric Acids

Spent Sulfuric Acid
Sulfuric Acid (98% or less)

3. Nitric Acid

Nitric Acid (70% or less)

4. Organic Acids

Acetic Acid
Butyric Acid
Formic Acid
Propionic Acid
Acrylic Acid (inhibited)

5. Caustics

Caustic Potash Solution
Caustic Soda Solution
Cresylate Spent Caustic Solution
Sodium Hydrosulfide Solution
(45% or less)

6. Ammonia

Ammonia, Anhydrous
Ammonium Hydroxide (28% or less)
Ammonium Nitrate, Urea, Water
Solutions (containing Ammonia)

7. Aliphatic Amines

Butylamine
Cyclohexylamine
Dibutylamine
Diethylamine
Diethylenetriamine
Diisopropylamine
Dimethylamine
Di-n-propylamine
Ethylamine
Ethylenediamine
Hexamethyleneimine
Methylamine
Morpholine
Propylamine
Tetraethylenepentamine
Triethylamine
Triethylenetetramine

8. Alkanolamines

Aminoethylethanolamine
Diethanolamine
Diethylethanolamine
Diisopropanolamine
Dimethylethanolamine
Ethanolamine
Propanolamine
Triethanolamine

9. Aromatic Amines

Aniline
Pyridine
2-Methyl-5-Ethylpyridine

10. Amides

Dimethylformamide

TABLE 7.2

REACTIVITY GROUPS (Continued)

11. Organic Anhydrides

Acetic Anhydride
Phthalic Anhydride
Propionic Anhydride

12. Isocyanates

Diphenylmethane Diisocyanate
Polyphenyl Polymethylene-isocyanate
Toluene Diisocyanate

13. Vinyl Acetate

Vinyl Acetate (inhibited)

14. Acrylates

Butyl Acrylate (inhibited)
Butyl Methacrylate (inhibited)
Decyl Acrylate (inhibited)
Ethyl Acrylate (inhibited)
2-Ethylhexyl Acrylate (inhibited)
Ethyl Methacrylate (inhibited)
Methyl Acrylate (inhibited)
Methyl Methacrylate (inhibited)

15. Substituted Allyls

Acrylonitrile (inhibited)
Allyl Alcohol
Allyl Chloride
1,3-Dichloropropene

16. Alkylene Oxides

Propylene Oxide
Butylene Oxide

17. Epichlorohydrin

Epichlorohydrin

18. Ketones

Acetone
Camphor Oil
Cyclohexanone
Diisobutyl Ketone
Isophorone
Mesityl Oxide
Methyl Ethyl Ketone
Methyl Isobutyl Ketone

19. Aldehydes

Acetaldehyde
Acrolein (inhibited)
Butyraldehyde
Decaldehyde
Ethylhexaldehyde
Formaldehyde
Glutaraldehyde Solution
Glyoxal Solution
Methylbutyraldehyde
Octyl Aldehyde
Pentyl Aldehyde
Propionaldehyde
Valeraldehyde

20. Alcohols, Glycols

Amyl Alcohol
Butyl Alcohol
1,3-Butylene Glycol
Cyclohexanol
Decyl Alcohol
Diacetone Alcohol
Diisobutyl Carbinol
Dodecanol
Ethanol
Ethoxylated Alcohols
C_{11}-C_{15}

TABLE 7.2

REACTIVITY GROUPS (Continued)

Ethyl Alcohol
Ethylbutanol
Ethylene Chlorohydrin
Ethylene Cyanohydrin
Ethylene Glycol
2-Ethyl Hexanol
Furfuryl Alcohol
Glycerin
Hexanol
Hexylene Glycol
Methanol
Methyl Alcohol
Methylamyl Alcohol
Methylisobutyl Carbinol
Octyl Alcohol
Nonyl Alcohol
Pentadecanol
Propyl Alcohol
Propylene Glycol
Sorbitol
Tallow Fatty Alcohol
Tetradecanol
Tridecanol
Undecanol

21. Phenols and Cresols

Carbolic Oil
Creosote, Coal Tar
Cresols
Nonyl Phenol
Phenol

22. Caprolactam Solution

Caprolactam Solution

23 - 29. Unassigned

30. Olefins

Butadiene (inhibited)
Butene
Butylene
Decene
Dicyclopentadiene
Diisobutylene
Dodecene
Ethylene
Hexene
Isoprene (inhibited)
Methyl Acetylene, Propadiene Mixture (stabilized)
(alpha-) Methyl Styrene (inhibited)
Nonene
Octene
Pentene
Polybutene
Polypropylene
Propylene
Propylene Butylene Polymer
Propylene Tetramer
Styrene (inhibited)
Vinyl Toluene (inhibited)
Tetradecene
Tridecene
Turpentine
Undecene

31. Paraffins

Butane
Cycloaliphatic Resins
Cyclohexane
Decane
Dodecane
Ethane
Heptane
Hexane
Methane
Nonane
Octane
Pentane
Propane

TABLE 7.2

REACTIVITY GROUPS (Continued)

32. Aromatic Hydrocarbons

Benzene
Benzene, Toluene, Xylene (crude)
Cumene
Cymene
Decylbenzene
Diethylbenzene
Dodecylbenzene
Ethylbenzene
Naphthalene
Tetradecylbenzene
Tetrahydronaphthalene
Toluene
Tridecylbenzene
Triethylbenzene
Undecylbenzene
Xylene

33. Misc. Hydrocarbon Mixtures

Asphalt
Asphalt Blending Stocks
Diphenyl - Diphenyl Oxide
Distillates
Gas Oil, Cracked
Gasoline Blending Stocks
Gasolines
Jet Fuels
Kerosene
Mineral Spirits
Naphtha
Oils, Crude
Oils, Diesel
Oils, Coal
Oils, Fuel (No. 1 thru No. 6)
Oils, Residual
Oils, Road
Oils, Transformer
Petrolatum
Petroleum Naphtha

34. Esters

Amyl Acetate
Amyl Tallate
Butyl Acetate
Butyl Benzyl Phthalate
Castor Oil
Coconut Oil
Cottonseed Oil
Dibutyl Phthalate
Diethylene Glycol Monobutyl Ether Acetate
Diheptyl Phthalate
Diisodecyl Phthalate
Dinonyl Phthalate
Dioctyl Phthalate
Diundecyl Phthalate
Ethyl Acetate
Ethylene Glycol Monobutyl Ether Acetate
Ethylene Glycol Monoethyl Ether Acetate
Ethylhexyl Tallate
Fish Oil
Glycol Diacetate
Lard
Methyl Acetate
Methyl Amyl Acetate
Octyl Epoxy Tallate
Olive Oil
Palm Oil
Peanut Oil
Propyl Acetate
Safflower Oil
Soybean Oil
Tallow
Tucum Oil
Vegetable Oil

35. Vinyl Halides

Vinyl Chloride (inhibited)
Vinylidene Chloride (inhibited)

36. Halogenated Hydrocarbons

Carbon Tetrachloride
Chlorobenzene

TABLE 7.2

REACTIVITY GROUPS (Continued)

Chloroform
Dichlorobenzene
1,1-Dichloroethane
Dichloroethyl Ether
Dichloromethane
1,1-Dichloropropane
1,2-Dichloropropane
Ethyl Chloride
Ethylene Dibromide
Ethylene Dichloride
Methyl Bromide
Methyl Chloride
Pentachloroethane
Perchloroethylene
1,1,2,2-Tetrachloroethane
1,2,4-Trichlorobenzene
Trichloroethylene

37 Nitriles

Acetonitrile
Adiponitrile

38. Carbon Disulfide

39. Sulfolane

40. Glycol Ethers

Diethylene Glycol
Diethylene Glycol Monobutyl Ether
Diethylene Glycol Monoethyl Ether
Diethylene Glycol Monomethyl Ether
Dipropylene Glycol
Ethoxy Triglycol
Ethylene Glycol Monobutyl Ether
Ethylene Glycol Monethyl Ether
Ethylene Glycol Monomethyl Ether
Nonylphenol, Ethoxylated
Polyethylene Glycols
Polypropylene Glycols
Polypropylene Glycol Methyl Ether
Soybean Oil, Epoxidized
Tetraethylene Glycol
Triethylene Glycol
Tripropylene Glycol

41. Ethers

Butyl Ether
1,4-Dioxane
Ethyl Ether
Methyl Formal (Dimethyl Formal)
Propyl Ether
Tetrahydrofuran

42. Nitrocompounds

(mono-) Nitrobenzene
1- or 2-Nitropropane
Nitrotoluene

43. Miscellaneous Water Solutions

Ammonium Nitrate, Urea, Water Solutions (not containing Ammonia)
Corn Syrup
Dextrose Solution
Latex Solutions
Tetrasodium Salt of EDTA Solution

TABLE 7.3

COMBINATIONS NOT DANGEROUSLY REACTIVE
(as tested in accordance with procedure outlined in NVC 5-70)

Acetone (8)	Caustic soda solution (3)
Acrylonitrile (inhibited) (14)	Methyl alcohol (6)
Acrylonitrile (inhibited) (14)	Niax polyol (6)*
Acrylonitrile (inhibited) (14)	Polyol 3030 (6)*
Acrylonitrile (inhibited) (14)	Propylene glycol (6)
Acrylonitrile (inhibited) (14)	Voranol CP 4100 (6)*
Benzene (10)	Phosphoric acid (1)
Butyl acetate (n-, iso-*) (13)	Caustic soda solution (3)
Butyl acrylate (inhibited) (14)	Methyl alcohol (6)
Butyl acrylate (inhibited) (14)	Voranol CP 4100 (6)*
n-Butyl alcohol (6)	Styrene (inhibited) (14)
n-Butyl alcohol (6)	Vinyl acetate (inhibited) (14)
Carbon tetrachloride (5)	Caustic soda solution (3)
Caustic soda solution (3)	Acetone (8)
Caustic soda solution (3)	Butyl acetate (iso-*, n-) (13)
Caustic soda solution (3)	Carbon tetrachloride (5)
Caustic soda solution (3)	Oils, edible: coconut (13)*
Caustic soda solution (3)	Oils, edible: cottonseed (13)
Caustic soda solution (3)	Dichloropropane (5)
Caustic soda solution (3)	Dichloropropene (5)
Caustic soda solution (3)	Diisodecyl phthalate (13)*
Caustic soda solution (3)	Di-normal-alkyl phthalate (13)*
Caustic soda solution (3)	Dioctyl phthalate (13)
Caustic soda solution (3)	Ethyl acetate (13)
Caustic soda solution (3)	Ethylene dichloride (5)
Caustic soda solution (3)	Oils, edible: fish (13)
Caustic soda solution (3)	Grease (inedible, yellow) (13)*
Caustic soda solution (3)	Lard (edible) (13)*
Caustic soda solution (3)	Linseed oil (raw) (13)*
Caustic soda solution (3)	Methylene chloride (5)*
Caustic soda solution (3)	Methyl ethyl ketone (8)
Caustic soda solution (3)	Methyl isobutyl ketone (8)
Caustic soda solution (3)	Palm oil (13)*
Caustic soda solution (3)	Perchloroethylene (5)*
Caustic soda solution (3)	Propyl acetate (iso-*, n-) (13)
Caustic soda solution (3)	Oils, edible: soya bean (13)
Caustic soda solution (3)	Oils, miscellaneous: sperm
Caustic soda solution (3)	Styrene (inhibited) (14)
Caustic soda solution (3)	Tallow (13)
Caustic soda solution (3)	Trichloroethane (5)
Dichloropropane (5)	Caustic soda solution (3)
Dichloropropene (5)	Caustic soda solution (3)
Diisodecyl phthalate (13)*	Caustic soda solution (3)
Di-normal-alkyl phthalate (13)*	Caustic soda solution (3)
Dimethylformamide (4)	Furfural (7)
Dimethylformamide (4)	Phenol (15)
Dioctyl phthalate (13)	Caustic soda solution (3)
Dioctyl phthalate (13)	Ethylenediamine (4)
Diphenylmethanediisocyanate	Ethylene dichloride (5)
Ethyl acetate (13)	Caustic soda solution (3)
Ethyl acrylate (inhibited) (14)	Ethylene glycol (6)
Ethyl acrylate (inhibited) (14)	2-Ethyl hexanol (6)
Ethyl acrylate (inhibited) (14)	Voranol CP 4100 (6)*
Ethyl alcohol (6)	Methyl methacrylate (inhibited) (14)
Ethylenediamine (4)	Dioctyl phthalate (13)
Ethylene dichloride (5)	Caustic soda solution (3)
Ethylene dichloride (5)	Diphenylmethanediisocyanate
Ethylene glycol (6)	Ethyl acrylate (inhibited) (14)
Ethylene glycol (6)	Styrene (inhibited) (14)
Ethylene glycol (6)	Vinyl acetate (inhibited) (14)

*Not presently included in CHRIS.

TABLE 7.3

COMBINATIONS NOT DANGEROUSLY REACTIVE (Continued)

2-Ethyl hexanol (6)	Ethyl acrylate (inhibited) (14)
2-Ethyl hexanol (6)	Styrene (inhibited) (14)
Furfural (7)	Dimethylformamide (4)
Furfural (7)	Isopropyl alcohol (6)
Furfural (7)	Methyl ethyl ketone (8)
Grease (inedible, yellow) (13)*	Caustic soda solution (3)
Isobutyl alcohol (6)	Styrene (inhibited) (14)
Isobutyl alcohol (6)	Vinyl acetate (inhibited) (14)
Isodecyl alcohol (6)	Vinyl acetate (inhibited) (14)
Isooctyl alcohol (6)	Methyl methacrylate (inhibited) (14)
Isooctyl alcohol (6)	Styrene (inhibited) (14)
Isooctyl alcohol (6)	Vinyl acetate (inhibited) (14)
Isopropyl alcohol (6)	Furfural (7)
Isopropyl alcohol (6)	Styrene (inhibited) (14)
Isopropyl alcohol (6)	Vinyl acetate (inhibited) (14)
Lard (edible) (13)*	Caustic soda solution (3)
Linseed oil (raw) (13)*	Caustic soda solution (3)
Methyl alcohol (6)	Acrylonitrile (inhibited) (14)
Methyl alcohol (6)	Butyl acrylate (inhibited) (14)
Methyl alcohol (6)	Styrene (inhibited) (14)
Methyl alcohol (6)	Vinyl acetate (inhibited) (14)
Methylene chloride (5)*	Caustic soda solution (3)
Methyl ethyl ketone (8)	Caustic soda solution (3)
Methyl ethyl ketone (8)	Furfural (7)
Methyl isobutyl ketone (8)	Caustic soda solution (3)
Methyl methacrylate (inhibited) (14)	Ethyl alcohol (6)
Methyl methacrylate (inhibited) (14)	Isooctyl alcohol (6)
Niax polyol (6)*	Acrylonitrile (inhibited) (14)
Niax polyol (6)*	Vinyl acetate (inhibited) (14)
Oils, edible: coconut (13)*	Caustic soda solution (3)
Oils, edible: cottonseed (13)	Caustic soda solution (3)
Oils, edible: fish (13)	Caustic soda solution (3)
Oils, edible: soya bean (13)	Caustic soda solution (3)
Oils, miscellaneous: sperm	Caustic soda solution (3)
Palm oil (13)*	Caustic soda solution (3)
Perchloroethylene (5)*	Caustic soda solution (3)
Phenol (15)	Dimethyl formamide (4)
Phosphoric acid (1)	Benzene (10)
Phosphoric acid (1)	Toluene (10)
Phosphoric acid (1)	Xylene (10)
Polyol 3030 (6)*	Acrylonitrile (inhibited) (14)
Propyl acetate (iso-*, n-) (13)	Caustic soda solution (3)
Propylene glycol (6)	Acrylonitrile (inhibited) (14)
Propylene glycol (6)	Styrene (inhibited) (14)
Styrene (inhibited) (14)	n-Butyl alcohol (6)
Styrene (inhibited) (14)	Caustic soda solution (3)
Styrene (inhibited) (14)	Ethylene glycol (6)
Styrene (inhibited) (14)	2-Ethyl hexanol (6)
Styrene (inhibited) (14)	Isobutyl alcohol (6)
Styrene (inhibited) (14)	Isooctyl alcohol (6)
Styrene (inhibited) (14)	Isopropyl alcohol (6)
Styrene (inhibited) (14)	Methyl alcohol (6)
Styrene (inhibited) (14)	Propylene glycol (6)
Styrene (inhibited) (14)	Trichloroethylene (5)
Tallow (13)	Caustic soda solution (3)
Toluene (10)	Phosphoric acid (1)
Trichloroethane (5)	Caustic soda solution (3)
Trichloroethylene (5)	Styrene (inhibited) (14)
Vinyl acetate (inhibited) (14)	n-Butyl alcohol (6)
Vinyl acetate (inhibited) (14)	Ethylene glycol (6)

*Not presently included in CHRIS.

TABLE 7.3

COMBINATIONS NOT DANGEROUSLY REACTIVE (Continued)

Vinyl acetate (inhibited) (14)	Isobutyl alcohol (6)
Vinyl acetate (inhibited) (14)	Isodecyl alcohol (6)
Vinyl acetate (inhibited) (14)	Isooctyl alcohol (6)
Vinyl acetate (inhibited) (14)	Isopropyl alcohol (6)
Vinyl acetate (inhibited) (14)	Methyl alcohol (6)
Vinyl acetate (inhibited) (14)	Niax polyol (6)*
Vinyl acetate (inhibited) (14)	Voranol CP 4100 (6)*
Voranol CP 4100 (6)*	Acrylonitrile (inhibited) (14)
Voranol CP 4100 (6)*	Butyl acrylate (inhibited) (14)
Voranol CP 4100 (6)*	Ethyl acrylate (inhibited) (14)
Voranol CP 4100 (6)*	Vinyl acetate (inhibited) (14)
Xylene (10)	Phosphoric acid (1)

Toluene 2,4-diisocyanate (TDI), diphenylmethanediisocyanate (MDI), and polymethylene polyphenyl isocyanate (PAPI)* are considered compatible with reactivity groups 9, 10, 11, 12, 18, and 21.

*Not presently included in CHRIS.

8. INDEX OF SYNONYMS

SYNONYM		COMPOUND NAME
AATREX HERBICIDE	=	ATRAZINE
ABSORBENT OIL	=	OIL: ABSORPTION
ACETALDEHYDE	=	ACETALDEHYDE
ACETIC ACID	=	ACETIC ACID
ACETIC ACID, AMMONIUM SALT	=	AMMONIUM ACETATE
ACETIC ACID, BUTYL ESTER	=	N-BUTYL ACETATE
ACETIC ACID, CUPRIC SALT	=	COPPER ACETATE
ACETIC ACID, DIMETHYLAMIDE	=	DIMETHYLACETAMIDE
ACETIC ACID, ETHYL ESTER	=	ETHYL ACETATE
ACETIC ACID, ISOBUTYL ESTER	=	ISOBUTYL ACETATE
ACETIC ACID, ISOPROPYL ESTER	=	ISOPROPYL ACETATE
ACETIC ACID, METHYL ESTER	=	METHYL ACETATE
ACETIC ACID, NICKEL (II) SALT	=	NICKEL ACETATE
ACETIC ACID, PROPYL ESTER	=	N-PROPYL ACETATE
ACETIC ACID, SEC-BUTYL ESTER	=	SEC-BUTYL ACETATE
ACETIC ACID,ZINC SALT	=	ZINC ACETATE
ACETIC ALDEHYDE	=	ACETALDEHYDE
ACETIC ANHYDRIDE	=	ACETIC ANHYDRIDE
ACETIC ESTER	=	ETHYL ACETATE
ACETIC ETHER	=	ETHYL ACETATE
ACETOACETIC ACID, ETHYL ESTER	=	ETHYL ACETOACETATE
ACETOACETIC ESTER	=	ETHYL ACETOACETATE
ACETONE	=	ACETONE
ACETONE CYANOHYDRIN	=	ACETONE CYANOHYDRIN
ACETONITRILE	=	ACETONITRILE
ACETOPHENONE	=	ACETOPHENONE
ACETYLACETONE	=	ACETYLACETONE
ACETYLBENZENE	=	ACETOPHENONE
ACETYL BROMIDE	=	ACETYL BROMIDE
ACETYL CHLORIDE	=	ACETYL CHLORIDE
ACETYLENE	=	ACETYLENE
ACETYLENE DICHLORIDE	=	1,2-DICHLOROETHYLENE
ACETYLENE TETRACHLORIDE	=	TETRACHLOROETHANE
ACETYLENOGEN	=	CALCIUM CARBIDE
ACETYL HYDROPEROXIDE	=	PERACETIC ACID
ACETYL PEROXIDE SOLUTION	=	ACETYL PEROXIDE SOLUTION
ACID AMMONIUM CARBONATE	=	AMMONIUM BICARBONATE
ACID AMMONIUM FLUORIDE	=	AMMONIUM BIFLUORIDE
ACID CALCIUM PHOSPHATE	=	CALCIUM PHOSPHATE
ACRALDEHYDE	=	ACROLEIN
ACRIDINE	=	ACRIDINE
ACROLEIN	=	ACROLEIN
ACRYLALDEHYDE	=	ACROLEIN
ACRYLAMIDE	=	ACRYLAMIDE
ACRYLIC ACID	=	ACRYLIC ACID
ACRYLIC ACID, BUTYL ESTER	=	N-BUTYL ACRYLATE
ACRYLIC ACID, ETHYL ESTER	=	ETHYL ACRYLATE
ACRYLIC ACID, 2-ETHYLHEXYL ESTER	=	2-ETHYLHEXYL ACRYLATE, INHIBITED
ACRYLIC ACID, ISOBUTYL ESTER	=	ISO-BUTYL ACRYLATE
ACRYLIC ACID, METHYL ESTER	=	METHYL ACRYLATE
ACRYLIC ALDEHYDE	=	ACROLEIN
ACRYLIC AMIDE 50 PER CENT	=	ACRYLAMIDE
ACRYLONITRILE	=	ACRYLONITRILE
ACTIVATED CHARCOAL	=	CHARCOAL
ADACENE-12	=	1-DODECENE
ADIPIC ACID	=	ADIPIC ACID
ADIPIC ACID, BIS(2-ETHYLHEXYL) ESTER	=	DIOCTYL ADIPATE
ADIPINIC ACID	=	ADIPIC ACID
ADIPOL 2 EH	=	DIOCTYL ADIPATE
ADIPONITRILE	=	ADIPONITRILE
ADRONAL	=	CYCLOHEXANOL
AEROSOL SURFACTANT	=	DIOCTYL SODIUM SULFOSUCCINATE
AEROTHENE	=	TRICHLOROETHANE

SYNONYM	COMPOUND NAME
AFICIDE	BENZENE HEXACHLORIDE
AGROCIDE	BENZENE HEXACHLORIDE
ALBONE	HYDROGEN PEROXIDE
ALBUS	MERCURIC AMMONIUM CHLORIDE
ALCOHOL	ETHYL ALCOHOL
ALCOHOL C-10	N-DECYL ALCOHOL
ALCOHOL C-8	OCTANOL
ALDEHYDE C-10	DECALDEHYDE
ALDEHYDE-COLLIDINE	METHYLETHYLPYRIDINE
ALDEHYDINE	METHYLETHYLPYRIDINE
ALDIFEN	2,4-DINITROPHENOL
ALDRIN	ALDRIN
ALFA-TOX	DIAZINON
ALGYLEN	TRICHLOROETHYLENE
ALKAWAY LIQUID ALKALINE DERUSTER	BOILER COMPOUND, LIQUID
ALKYLBENZENESULFONIC ACIDS	ALKYLBENZENESULFONIC ACIDS
ALKYLBENZENESULFONIC ACID, SODIUM SALT	SODIUM ALKYLBENZENESULFONATES
ALLENE-METHYLACETYLENE MIXTURE	METHYLACETYLENE - PROPADIENE MIXTURE
ALLOMALEIC ACID	FUMARIC ACID
ALLYL ALCOHOL	ALLYL ALCOHOL
ALLYL BROMIDE	ALLYL BROMIDE
ALLYL CHLORIDE	ALLYL CHLORIDE
ALLYL CHLOROCARBONATE	ALLYL CHLOROFORMATE
ALLYL CHLOROFORMATE	ALLYL CHLOROFORMATE
ALLYLSILICONE TRICHLORIDE	ALLYLTRICHLOROSILANE
ALLYLTRICHLOROSILANE	ALLYLTRICHLOROSILANE
ALROWET D65	DIOCTYL SODIUM SULFOSUCCINATE
ALUMINUM CHLORIDE	ALUMINUM CHLORIDE
ALUMINUM ETHYL DICHLORIDE EADC	ETHYLALUMINUM DICHLORIDE
ALUMINUM ETHYL DICHLORIDE	ETHYLALUMINUM DICHLORIDE
ALUMINUM FLUORIDE	ALUMINUM FLUORIDE
ALUMINUM NITRATE	ALUMINUM NITRATE
ALUMINUM NITRATE NONAHYDRATE	ALUMINUM NITRATE
ALUMINUM SULFATE	ALUMINUM SULFATE
ALUMINUM TRIETHYL	TRIETHYLALUMINUM
ALUMINUM TRIISOBUTYL	TRIISOBUTYLALUMINUM
AMCHLOR	AMMONIUM CHLORIDE
AMERICAN PALM KERNEL OIL	OILS EDIBLE: TUCUM
AMINOBENZENE	ANILINE
1-AMINOBUTANE	N-BUTYLAMINE
AMINOCAPROIC LACTAM	CAPROLACTAM, LIQUID
1-AMINO-4-CHLOROBENZENE	P-CHLOROANILINE
2-AMINO-5-CHLOROTOLUENE	4-CHLORO-O-TOLUIDINE
AMINOCYCLOHEXANE	CYCLOHEXYLAMINE
AMINOETHANE	ETHYLAMINE
2-AMINOETHANOL	MONOETHANOLAMINE
BETA-AMINOETHYL ALCOHOL	MONOETHANOLAMINE
2-((2-AMINOETHYL)AMINO)ETHANOL	AMINOETHYLETHANOLAMINE
N-(2-AMINOETHYL)ETHANOLAMINE	AMINOETHYLETHANOLAMINE
AMINOETHYLETHANOLAMINE	AMINOETHYLETHANOLAMINE
AMINOFORM	HEXAMETHYLENETETRAMINE
2-AMINOISOBUTANE	TERT-BUTYLAMINE
AMINOMERCURIC CHLORIDE	MERCURIC AMMONIUM CHLORIDE
AMINOMETHANE	METHYLAMINE
2-AMINO-1-METHYLBENZENE	O-TOLUIDINE
1-AMINO-2-METHYLPROPANE	ISOBUTYLAMINE
2-AMINO-2-METHYLPROPANE	TERT-BUTYLAMINE
1-AMINONAPHTHALENE	1-NAPHTHYLAMINE
1-AMINONAPHTHALENE ALPHA-NAPHTHYLAMINE	1-NAPHTHYLAMINE
1-AMINO-2-NITROBENZENE	2-NITROANILINE
1-AMINO-4-NITROBENZENE	4-NITROANILINE
2-AMINOPROPANE	ISOPROPYLAMINE
1-AMINO-2-PROPANOL	MONOISOPROPANOLAMINE
2-AMINOTOLUENE	O-TOLUIDINE
ALPHA-AMINOTOLUENE	BENZYLAMINE

SYNONYM	COMPOUND NAME
AMMATE	AMMONIUM SULFAMATE
AMMOFORM	HEXAMETHYLENETETRAMINE
AMMONERIC	AMMONIUM CHLORIDE
AMMONIA ANHYDROUS	AMMONIA ANHYDROUS
AMMONIA SOAP	AMMONIUM OLEATE
AMMONIATED MERCURY	MERCURIC AMMONIUM CHLORIDE
AMMONIA WATER	AMMONIUM HYDROXIDE
AMMONIOFORMALDEHYDE	HEXAMETHYLENETETRAMINE
AMMONIUM ACETATE	AMMONIUM ACETATE
AMMONIUM ACID FLUORIDE	AMMONIUM BIFLUORIDE
AMMONIUM AMIDOSULFONATE	AMMONIUM SULFAMATE
AMMONIUM AMIDOSULPHATE	AMMONIUM SULFAMATE
AMMONIUM BENZOATE	AMMONIUM BENZOATE
AMMONIUM BICARBONATE	AMMONIUM BICARBONATE
AMMONIUM BICHROMATE	AMMONIUM DICHROMATE
AMMONIUM BIFLUORIDE	AMMONIUM BIFLUORIDE
AMMONIUM CARBONATE	AMMONIUM CARBONATE
AMMONIUM CHLORIDE	AMMONIUM CHLORIDE
AMMONIUM CITRATE	AMMONIUM CITRATE
AMMONIUM CITRATE, DIBASIC	AMMONIUM CITRATE
AMMONIUM DECABORATE OCTAHYDRATE	AMMONIUM PENTABORATE
AMMONIUM DICHROMATE	AMMONIUM DICHROMATE
AMMONIUM DISULFATO-NICKELATE (II)	NICKEL AMMONIUM SULFATE
AMMONIUM FERRIC CITRATE	FERRIC AMMONIUM CITRATE
AMMONIUM FERRIC OXALATE TRIHYDRATE	FERRIC AMMONIUM OXALATE
AMMONIUM FERROUS SULFATE	FERROUS AMMONIUM SULFATE
AMMONIUM FLUORIDE	AMMONIUM FLUORIDE
AMMONIUM FLUOSILICATE	AMMONIUM SILICOFLUORIDE
AMMONIUM FORMATE	AMMONIUM FORMATE
AMMONIUM GLUCONATE	AMMONIUM GLUCONATE
AMMONIUM HYDROGEN CARBONATE	AMMONIUM BICARBONATE
AMMONIUM HYDROGEN FLUORIDE	AMMONIUM BIFLUORIDE
AMMONIUM HYDROGEN SULFIDE SOLUTION	AMMONIUM SULFIDE
AMMONIUM HYDROXIDE	AMMONIUM HYDROXIDE
AMMONIUM HYPO	AMMONIUM THIOSULFATE
AMMONIUM HYPOSULFITE	AMMONIUM THIOSULFATE
AMMONIUM IODIDE	AMMONIUM IODIDE
AMMONIUM IRON SULFATE	FERROUS AMMONIUM SULFATE
AMMONIUM LACTATE	AMMONIUM LACTATE
AMMONIUM LACTATE SYRUP	AMMONIUM LACTATE
AMMONIUM LAURYL SULFATE	AMMONIUM LAURYL SULFATE
AMMONIUM MOLYBDATE	AMMONIUM MOLYBDATE
AMMONIUM MURIATE	AMMONIUM CHLORIDE
AMMONIUM NICKEL SULFATE	NICKEL AMMONIUM SULFATE
AMMONIUM NITRATE	AMMONIUM NITRATE
AMMONIUM NITRATE-PHOSPHATE MIXTURE	AMMONIUM NITRATE-PHOSPHATE MIXTURE
AMMONIUM NITRATE-SULFATE MIXTURE	AMMONIUM NITRATE-SULFATE MIXTURE
AMMONIUM NITRATE-UREA SOLUTION	AMMONIUM NITRATE-UREA SOLUTION
AMMONIUM OLEATE	AMMONIUM OLEATE
AMMONIUM OXALATE	AMMONIUM OXALATE
AMMONIUM OXALATE HYDRATE	AMMONIUM OXALATE
AMMONIUM PENTABORATE	AMMONIUM PENTABORATE
AMMONIUM PENTABORATE TETRAHYDRATE	AMMONIUM PENTABORATE
AMMONIUM PENTACHLOROZINCATE	ZINC AMMONIUM CHLORIDE
AMMONIUM PERCHLORATE	AMMONIUM PERCHLORATE
AMMONIUM PEROXYDISULFATE	AMMONIUM PERSULFATE
AMMONIUM PERSULFATE	AMMONIUM PERSULFATE
AMMONIUM PHOSPHATE	AMMONIUM PHOSPHATE
AMMONIUM PHOSPHATE, DIBASIC	AMMONIUM PHOSPHATE
AMMONIUM RHODANATE	AMMONIUM THIOCYANATE
AMMONIUM RHODANIDE	AMMONIUM THIOCYANATE
AMMONIUM SILICOFLUORIDE	AMMONIUM SILICOFLUORIDE
AMMONIUM STEARATE	AMMONIUM STEARATE
AMMONIUM STEARATE DISPERSION	AMMONIUM STEARATE
AMMONIUM SULFAMATE	AMMONIUM SULFAMATE

SYNONYM		COMPOUND NAME
AMMONIUM SULFATE	=	AMMONIUM SULFATE
AMMONIUM SULFHYDRATE SOLUTION	=	AMMONIUM SULFIDE
AMMONIUM SULFIDE	=	AMMONIUM SULFIDE
AMMONIUM SULFIDE SOLUTION	=	AMMONIUM SULFIDE
AMMONIUM SULFITE	=	AMMONIUM SULFITE
AMMONIUM SULFOCYANATE	=	AMMONIUM THIOCYANATE
AMMONIUM SULFOCYANIDE	=	AMMONIUM THIOCYANATE
AMMONIUM TARTRATE	=	AMMONIUM TARTRATE
AMMONIUM THIOCYANATE	=	AMMONIUM THIOCYANATE
AMMONIUM THIOSULFATE	=	AMMONIUM THIOSULFATE
AMMONIUM TRIOXALATOFERRATE TRIHYDRATE	=	FERRIC AMMONIUM OXALATE
AMMONIUM ZINC CHLORIDE	=	ZINC AMMONIUM CHLORIDE
AMORPHOUS PHOSPHORUS	=	PHOSPHORUS, RED
APS	=	AMMONIUM SULFAMATE
AMYL ACETATE	=	AMYL ACETATE
AMYL ACETATES, MIXED ISOMERS	=	AMYL ACETATE
N-AMYL ALCOHOL	=	N-AMYL ALCOHOL
1-AMYL ALCOHOL	=	N-AMYL ALCOHOL
AMYL ALDEHYDE	=	VALERALDEHYDE
AMYL CARBINOL	=	HEXANOL
AMYL CHLORIDE	=	N-AMYL CHLORIDE
N-AMYL CHLORIDE	=	N-AMYL CHLORIDE
ALPHA-N-AMYLENE	=	1-PENTENE
AMYL HYDROSULFIDE	=	N-AMYL MERCAPTAN
N-AMYL MERCAPTAN	=	N-AMYL MERCAPTAN
N-AMYL METHYL KETONE	=	N-AMYL METHYL KETONE
N-AMYL NITRATE	=	N-AMYL NITRATE
AMYL NITRITE	=	ISO-AMYL NITRITE
ISO-AMYL NITRITE	=	ISO-AMYL NITRITE
AMYL SULFHYDRATE	=	N-AMYL MERCAPTAN
AMYL THIOALCOHOL	=	N-AMYL MERCAPTAN
N-AMYLTRICHLOROSILANE	=	N-AMYLTRICHLOROSILANE
ANESTHESIA ETHER	=	ETHYL ETHER
ANHYDRONE	=	MAGNESIUM PERCHLORATE
ANHYDROUS ALUMINUM CHLORIDE	=	ALUMINUM CHLORIDE
ANILINE	=	ANILINE
ANILINE OIL	=	ANILINE
ANILINOBENZENE	=	DIPHENYLAMINE
ANILINOMETHANE	=	N-METHYLANILINE
ANIMAL CARBON	=	CHARCOAL
ANIMAL CHARCOAL	=	CHARCOAL
ANISOYL CHLORIDE	=	ANISOYL CHLORIDE
P-ANISOYL CHLORIDE	=	ANISOYL CHLORIDE
ANOL	=	CYCLOHEXANOL
ANONE	=	CYCLOHEXANONE
ANSAR	=	CACODYLIC ACID
ANSUL ETHER 121	=	ETHYLENE GLYCOL DIMETHYL ETHER
ANTHRACENE	=	ANTHRACENE
ANTHRACIN	=	ANTHRACENE
ANTIMONY BUTTER	=	ANTIMONY TRICHLORIDE
ANTIMONY (III) CHLORIDE	=	ANTIMONY TRICHLORIDE
ANTIMONY (V) CHLORIDE	=	ANTIMONY PENTACHLORIDE
ANTIMONY PENTACHLORIDE	=	ANTIMONY PENTACHLORIDE
ANTIMONY PENTAFLUORIDE	=	ANTIMONY PENTAFLUORIDE
ANTIMONY PERCHLORIDE	=	ANTIMONY PENTACHLORIDE
ANTIMONY POTASSIUM TARTRATE	=	ANTIMONY POTASSIUM TARTRATE
ANTIMONY TRICHLORIDE	=	ANTIMONY TRICHLORIDE
ANTIMONY TRIFLUORIDE	=	ANTIMONY TRIFLUORIDE
ANTIMONY TRIOXIDE	=	ANTIMONY TRIOXIDE
AQUARA OIL	=	OILS EDIBLE: TUCUM
APARASIN	=	BENZENE HEXACHLORIDE
APHTIRIA	=	BENZENE HEXACHLORIDE
APO	=	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
AQUEOUS AMMONIA	=	AMMONIUM HYDROXIDE
ARASAN	=	THIRAM

SYNONYM		COMPOUND NAME
ARCTON 9	=	TRICHLOROFLUOROMETHANE
ARGENTOUS FLUORIDE	=	SILVER FLUORIDE
ARGENTOUS OXIDE	=	SILVER OXIDE
AROCHLOR	=	POLYCHLORINATED BIPHENYL (PCB)
ARSECODILE	=	SODIUM CACODYLATE
ARSENIC ACID	=	ARSENIC ACID
ARSENIC CHLORIDE	=	ARSENIC TRICHLORIDE
ARSENIC DISULFIDE	=	ARSENIC DISULFIDE
ARSENIC PENTOXIDE	=	ARSENIC ACID
ARSENIC SESQUIOXIDE	=	ARSENIC TRIOXIDE
ARSENIC TRICHLORIDE	=	ARSENIC TRICHLORIDE
ARSENIC (III) TRICHLORIDE	=	ARSENIC TRICHLORIDE
ARSENIC TRIOXIDE	=	ARSENIC TRIOXIDE
ARSENIC TRISULFIDE	=	ARSENIC TRISULFIDE
ARSENIC YELLOW	=	ARSENIC TRISULFIDE
ARSENIOUS CHLORIDE	=	ARSENIC TRICHLORIDE
ARSENOUS ACID	=	ARSENIC TRIOXIDE
ARSENOUS ACID ANHYDRIDE	=	ARSENIC TRIOXIDE
ARSENOUS CHLORIDE	=	ARSENIC TRICHLORIDE
ARSENOUS OXIDE	=	ARSENIC TRIOXIDE
ARSICODILE	=	SODIUM CACODYLATE
ARSYCODILE	=	SODIUM CACODYLATE
ARTIC	=	METHYL CHLORIDE
ARTIFICIAL CINNABAR	=	MERCURIC SULFIDE
ASPHALT	=	ASPHALT
ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
ASPHALT BLENDING STOCK:ROOFERS FLUX	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
ASPHALT CEMENTS	=	ASPHALT
ASPHALTIC BITUMEN	=	ASPHALT
ASPHALTUM OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
ATE	=	TRIETHYLALUMINUM
ATRAZINE	=	ATRAZINE
10-AZAANTHRACENE	=	ACRIDINE
AZACYCLOHEPTANE	=	HEXAMETHYLENEIMINE
1-AZANAPHTHALENE	=	QUINOLINE
AZINPHOSMETHYL	=	AZINPHOSMETHYL
AZIRANE	=	ETHYLENEIMINE
AZIRIDINE	=	ETHYLENEIMINE
TRIS (1-AZIRIDINYL) PHOSPHINE OXIDE	=	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
AZOIC DIAZO COMPONENT 6	=	2-NITROANILINE
AZOIC DIAZO COMPONENT 37	=	4-NITROANILINE
BARIUM BINOXIDE	=	BARIUM PEROXIDE
BARIUM CARBONATE	=	BARIUM CARBONATE
BARIUM CHLORATE	=	BARIUM CHLORATE
BARIUM CHLORATE MONOHYDRATE	=	BARIUM CHLORATE
BARIUM DIOXIDE	=	BARIUM PEROXIDE
BARIUM NITRATE	=	BARIUM NITRATE
BARIUM PERCHLORATE	=	BARIUM PERCHLORATE
BARIUM PERCHLORATE TRIHYDRATE	=	BARIUM PERCHLORATE
BARIUM PERMANGANATE	=	BARIUM PERMANGANATE
BARIUM PEROXIDE	=	BARIUM PEROXIDE
BARIUM SUPEROXIDE	=	BARIUM PEROXIDE
BASIC BISMUTH CHLORIDE	=	BISMUTH OXYCHLORIDE
BASIC ZIRCONIUM CHLORIDE	=	ZIRCONIUM OXYCHLORIDE
BATTERY ACID	=	SULFURIC ACID
BBH	=	BENZENE HEXACHLORIDE
BEARING OIL	=	OIL: SPINDLE
BEET SUGAR	=	SUCROSE
BEN-HEX	=	BENZENE HEXACHLORIDE
BENZALDEHYDE	=	BENZALDEHYDE
1-BENZAZINE	=	QUINOLINE
BENZENE	=	BENZENE
BENZENE, MIXTURE WITH TOLUENE AND XYLENES	=	NAPHTHA COAL TAR

SYNONYM		COMPOUND NAME
BENZENECARBINOL	=	BENZYL ALCOHOL
BENZENECARBONYL CHLORIDE	=	BENZOYL CHLORIDE
BENZENECARBOXYLIC ACID	=	BENZOIC ACID
1,2-BENZENEDICARBOXYLIC ACID ANHYDRIDE	=	PHTHALIC ANHYDRIDE
1,2-BENZENEDICARBOXYLIC ACID, DIETHYL ESTER	=	DIETHYL PHTHALATE
BENZENE CHLORIDE	=	CHLOROBENZENE
BENZENE-1,3-DICARBOXYLIC ACID	=	ISOPHTHALIC ACID
1,4-BENZENEDIOL	=	HYDROQUINONE
1,3-BENZENEDIOL	=	RESORCINOL
1,2-BENZENEDIOL	=	CATECHOL
BENZENE HEXACHLORIDE	=	BENZENE HEXACHLORIDE
BENZENE PHOSPHORUS DICHLORIDE	=	BENZENE PHOSPHORUS DICHLORIDE
BENZENE PHOSPHORUS THIOCICHLORIDE	=	BENZENE PHOSPHORUS THIOCICHLORIDE
BENZENETHIOPHOSPHONYL CHLORIDE	=	BENZENE PHOSPHORUS THIODICHLORIDE
1,2,3-BENZENETRIOL	=	PYROGALLIC ACID
BENZINOFORM	=	CARBON TETRACHLORIDE
BENZOIC ACID	=	BENZOIC ACID
BENZOIC ACID, AMMONIUM SALT	=	AMMONIUM BENZOATE
BENZOIC ACID NITRILE	=	BENZONITRILE
BENZOIC ALDEHYDE	=	BENZALDEHYDE
BENZOL	=	BENZENE
BENZOLE	=	BENZENE
BENZONITRILE	=	BENZONITRILE
BENZOPHENONE	=	BENZOPHENONE
BENZO(B)PYRIDINE	=	QUINOLINE
BENZO(B)QUINOLINE	=	ACRIDINE
BENZOYLBENZENE	=	BENZOPHENONE
BENZOYL CHLORIDE	=	BENZOYL CHLORIDE
BENZOYL PEROXIDE	=	DIBENZOYL PEROXIDE
BENZOYL SUPEROXIDE	=	DIBENZOYL PEROXIDE
BENZYL ALCOHOL	=	BENZYL ALCOHOL
BENZYLAMINE	=	BENZYLAMINE
BENZYL BROMIDE	=	BENZYL BROMIDE
BENZYL N-BUTYL PHTHALATE	=	BENZYL N-BUTYL PHTHALATE
BENZYLCARBONYL CHLORIDE	=	BENZYL CHLOROFORMATE
BENZYL CHLORIDE	=	BENZYL CHLORIDE
BENZYL CHLOROCARBONATE	=	BENZYL CHLOROFORMATE
BENZYL CHLOROFORMATE	=	BENZYL CHLOROFORMATE
BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE	=	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
BENZYLDIMETHYLSTEARYLAMMONIUM CHLORIDE	=	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
BENZYLTRIMETHYLAMMONIUM CHLORIDE	=	BENZYLTRIMETHYLAMMONIUM CHLORIDE
BERYLLIA	=	BERYLLIUM OXIDE
BERYLLIUM CHLORIDE	=	BERYLLIUM CHLORIDE
BERYLLIUM FLUORIDE	=	BERYLLIUM FLUORIDE
BERYLLIUM, METALLIC	=	BERYLLIUM, METALLIC
BERYLLIUM NITRATE	=	BERYLLIUM NITRATE
BERYLLIUM NITRATE TRIHYDRATE	=	BERYLLIUM NITRATE
BERYLLIUM OXIDE	=	BERYLLIUM OXIDE
BERYLLIUM SULFATE	=	BERYLLIUM SULFATE
BERYLLIUM SULFATE TETRAHYDRATE	=	BERYLLIUM SULFATE
BETAPRONE	=	BETA-PROPIOLACTONE
BHC	=	BENZENE HEXACHLORIDE
BICHROME	=	POTASSIUM DICHROMATE
BICYCLO (4.4.0) DECANE	=	DECAHYDRONAPHTHALENE
BIEBERITE	=	COBALT SULFATE
BIETHYLENE	=	BUTADIENE, INHIBITED
BIFORMAL	=	GLYOXAL, 40% SOLUTION
BIFORMYL	=	GLYOXAL, 40% SOLUTION
BIPHENYL-DIPHENYL ETHER	=	DOWTHERM
BIS(ACETATO)DIOXOURANIUM	=	URANYL ACETATE
BIS(2-AMINOETHYL)AMINE	=	DIETHYLENETRIAMINE
N,N -BIS(2-AMINOETHYL) ETHYLENEDIAMINE	=	TRIETHYLENETETRAMINE

SYNONYM		COMPOUND NAME
BIS(P-CHLOROBENZOYL)PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
BIS-(P-CHLOROBENZOYL) PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
BIS(2-CHLOROETHYL)ETHER	=	DICHLOROETHYL ETHER
BIS (2-CHLOROETHYL) ETHER	=	DICHLOROETHYL ETHER
1,1-BIS(P-CHLOROPHENYL)-2,2,2-TRICHOROETHANOL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
BIS (DIMETHYLTHIOCARBAMOYL) DISULFIDE	=	THIRAM
BIS(DIMETHYLTHICCARBAMYL) DISULFIDE	=	THIRAM
S-(1,2-BIS(ETHOXYCARBONYL)ETHYL)-O,O-DIMETHYL PHOSPHORODITHIOATE	=	MALATHION
BIS(2-ETHYLHEXYL) HYDROGEN PHOSPHATE	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
BIS-(2-ETHYLHEXYL) HYDROGEN PHOSPHATE	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
BIS(2-ETHYLHEXYL)PHTHALATE	=	DIOCTYL PHTHALATE
BIS(2-ETHYLHEXYL)SODIUM SULFOSUCCINATE	=	DIOCTYL SODIUM SULFOSUCCINATE
BIS(2-(2-HYDROXYETHOXY)ETHYL)ETHER	=	TETRAETHYLENE GLYCOL
BIS(2-HYDROXYETHYL)AMINE	=	DIETHANOLAMINE
BIS(2-HYDROXYETHYL)ETHER	=	DIETHYLENE GLYCOL
2,2-BIS(4-HYDROXYPHENYL)PROPANE	=	BISPHENOL A
BIS(2-METHOXYETHYL)ETHER	=	DIETHYLENE GLYCOL DIMETHYL ETHER
2,2-BIS(P-METHOXYPHENYL)-1,1,1 -TRICHLOROETHANE	=	METHOXYCHLOR
BISMUTH CHLORIDE OXIDE	=	BISMUTH OXYCHLORIDE
BISMUTH OXYCHLORIDE	=	BISMUTH OXYCHLORIDE
BISMUTH SUBCHLORIDE	=	BISMUTH OXYCHLORIDE
BISMUTHYL CHLORIDE	=	BISMUTH OXYCHLORIDE
BISPHENOL A	=	BISPHENOL A
BISPHENOL A DIGLYCIDYL ETHER	=	BISPHENOL A DIGLYCIDYL ETHER
BISPHENOL A EPICHLOROHYDRIN CONDENSATE	=	BISPHENOL A DIGLYCIDYL ETHER
BITUMEN	=	ASPHALT
BIVINYL	=	BUTADIENE, INHIBITED
BLACK LEAF 40 (40 PER CENT WATER SOLUTION)	=	NICOTINE SULFATE
BLACK OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
BLADAN	=	TETRAETHYL PYROPHOSPHATE
BLUE OIL	=	ANILINE
BLUE VITRIOL	=	COPPER SULFATE
BOILER COMPOUND, LIQUID	=	BOILER COMPOUND, LIQUID
BOLETIC ACID	=	FUMARIC ACID
BORACIC ACID	=	BORIC ACID
BORAX,ANHYDROUS	=	SODIUM BORATE
BORIC ACID	=	BORIC ACID
BORON CHLORIDE	=	BORON TRICHLORIDE
BORON TRIBROMIDE	=	BORON TRIBROMIDE
BORON TRICHLORIDE	=	BORON TRICHLORIDE
BOTTLED GAS	=	LIQUEFIED PETROLEUM GAS (LPG)
BOX TOE GUM	=	COLLODION
BP	=	DIBENZOYL PEROXIDE
BPO	=	DIBENZOYL PEROXIDE
BRIMSTONE (LIQUID)	=	SULFUR(LIQUID)
BROCIDE	=	ETHYLENE DICHLORIDE
BROMALLYLENE	=	ALLYL BROMIDE
BROMELLITE	=	BERYLLIUM OXIDE
BROMINE	=	BROMINE
BROMINE PENTAFLUORIDE	=	BROMINE PENTAFLUORIDE
BROMINE TRIFLUORIDE	=	BROMINE TRIFLUORIDE
BROMOBENZENE	=	BROMOBENZENE
BROMOBENZOL	=	BROMOBENZENE
BROMOFUME	=	ETHYLENE DIBROMIDE
BROMOMETHANE	=	METHYL BROMIDE
3-BROMOPROPENE	=	ALLYL BROMIDE
3-BROMOPROPYLENE	=	ALLYL BROMIDE
ALPHA-BROMOTOLUENE	=	BENZYL BROMIDE
BROMOTOLUENE, ALPHA	=	BENZYL BROMIDE
OMEGA-BROMOTOLUENE	=	BENZYL BROMIDE
BRUCINE	=	BRUCINE

SYNONYM		COMPOUND NAME
BRUCINE DIHYDRATE	=	BRUCINE
BTMAC	=	BENZYLTRIMETHYLAMMONIUM CHLORIDE
BUNKER C OIL	=	FUEL OIL: 6
1,3-BUTADIENE	=	BUTADIENE, INHIBITED
BUTADIENE, INHIBITED	=	BUTADIENE, INHIBITED
BUTAL	=	N-BUTYRALDEHYDE
BUTALDEHYDE	=	N-BUTYRALDEHYDE
BUTANAL	=	N-BUTYRALDEHYDE
1-BUTANAMINE, N-BUTYL	=	DI-N-BUTYLAMINE
BUTANE	=	BUTANE
N-BUTANE	=	BUTANE
1,4-BUTANEDICARBOXYLIC ACID	=	ADIPIC ACID
1,4-BUTANEDIOL	=	1,4-BUTANEDIOL
1-BUTANETHIOL	=	N-BUTYL MERCAPTAN
BUTANIC ACID	=	N-BUTYRIC ACID
BUTANOIC ACID	=	N-BUTYRIC ACID
BUTANOL	=	N-BUTYL ALCOHOL
1-BUTANOL	=	N-BUTYL ALCOHOL
2-BUTANOL	=	SEC-BUTYL ALCOHOL
2-BUTANONE	=	METHYL ETHYL KETONE
TRANS-2-BUTENAL	=	CROTONALDEHYDE
1-BUTENE	=	BUTYLENE
CIS-BUTENEDIOIC ACID	=	MALEIC ACID
TRANS-BUTENEDIOIC ACID	=	FUMARIC ACID
CIS-BUTENEDIOIC ANHYDRIDE	=	MALEIC ANHYDRIDE
1,4-BUTENEDIOL	=	1,4-BUTENEDIOL
CIS-2-BUTENE-1,4-DIOL	=	1,4-BUTENEDIOL
3-BUTEN-2-ONE	=	METHYL VINYL KETONE
1-BUTENE OXIDE	=	BUTYLENE OXIDE
BUTENE RESINS	=	POLYBUTENE
1-BUTOXYBUTANE	=	DI-N-BUTYL ETHER
BUTOXYDIETHYLENE GLYCOL	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
BUTOXYDIGLYCOL	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
2-BUTOXYETHANOL	=	ETHYLENE GLYCOL MONOBUTYL ETHER
2-BUTOXYETHANOL, ACETATE	=	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
2-(2-BUTOXYETHOXY)ETHYL ACETATE	=	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
2-BUTOXYETHYL ACETATE	=	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
BUTOXYETHYL 2,4-DICHLOROPHENOXYACETATE	=	2,4-D ESTERS
BUTOXYPROPYL TRICHLOROPHENOXYACETATE	=	2,4,5-T(ESTERS)
BUTTERCUP YELLOW	=	ZINC CHROMATE
BUTTER OF ANTIMONY	=	ANTIMONY TRICHLORIDE
BUTTER OF ARSENIC	=	ARSENIC TRICHLORIDE
BUTYL ACETATE	=	N-BUTYL ACETATE
N-BUTYL ACETATE	=	N-BUTYL ACETATE
SEC-BUTYL ACETATE	=	SEC-BUTYL ACETATE
BUTYL ACRYLATE	=	N-BUTYL ACRYLATE
ISO-BUTYL ACRYLATE	=	ISO-BUTYL ACRYLATE
N-BUTYL ACRYLATE	=	N-BUTYL ACRYLATE
BUTYL ALCOHOL	=	N-BUTYL ALCOHOL
N-BUTYL ALCOHOL	=	N-BUTYL ALCOHOL
SEC-BUTYL ALCOHOL	=	SEC-BUTYL ALCOHOL
TERT-BUTYL ALCOHOL	=	TERT-BUTYL ALCOHOL
BUTYL ALDEHYDE	=	N-BUTYRALDEHYDE
N-BUTYL ALPHA-METHYL ACRYLATE	=	N-BUTYL METHACRYLATE
BUTYLAMINE	=	N-BUTYLAMINE
N-BUTYLAMINE	=	N-BUTYLAMINE
SEC-BUTYLAMINE	=	SEC-BUTYLAMINE
TERT-BUTYLAMINE	=	TERT-BUTYLAMINE
BUTYL BENZYL PHTHALATE	=	BENZYL N-BUTYL PHTHALATE
N-BUTYLCARBINOL	=	N-AMYL ALCOHOL
N-BUTYLCARBINYL CHLORIDE	=	N-AMYL CHLORIDE
BUTYL CARBITOL	=	DIETHYLENE GLYCOL MONOBUTYL ETHER

SYNONYM		COMPOUND NAME
BUTYL CARBITOL ACETATE	=	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
BUTYL CELLOSOLVE	=	ETHYLENE GLYCOL MONOBUTYL ETHER
BUTYL [CELLOSOLVE] ACETATE	=	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
BUTYL 2,4-DICHLOROPHENOXYACETATE	=	2,4-D ESTERS
BUTYLENE	=	BUTYLENE
2-BUTYLENE DICHLORIDE	=	DICHLOROBUTENE
BUTYLENE HYDRATE	=	SEC-BUTYL ALCOHOL
BUTYLENE OXIDE	=	BUTYLENE OXIDE
ALPHA-BUTYLENE OXIDE	=	BUTYLENE OXIDE
1,2-BUTYLENE OXIDE	=	BUTYLENE OXIDE
BUTYL ETHANOATE	=	N-BUTYL ACETATE
BUTYL ETHER	=	DI-N-BUTYL ETHER
N-BUTYLETHER	=	DI-N-BUTYL ETHER
BUTYLETHYLACETALDEHYDE	=	ETHYLHEXALDEHYDE
TERT-BUTYL HYDROPEROXIDE	=	TERT-BUTYL HYDROPEROXIDE
N-BUTYL MERCAPTAN	=	N-BUTYL MERCAPTAN
BUTYL METHACRYLATE	=	N-BUTYL METHACRYLATE
N-BUTYL METHACRYLATE	=	N-BUTYL METHACRYLATE
BUTYL 2-METHACRYLATE	=	N-BUTYL METHACRYLATE
N-BUTYL METHYL KETONE	=	METHYL N-BUTYL KETONE
BUTYL 2-METHYL-2-PROPENOATE	=	N-BUTYL METHACRYLATE
P-TERT-BUTYLPHENOL	=	P-TERT-BUTYLPHENOL
BUTYL PHTHALATE	=	DIBUTYL PHTHALATE
BUTYL 2-PROPENOATE	=	N-BUTYL ACRYLATE
BUTYL TITANATE	=	TETRABUTYL TITANATE
BUTYL TITANATE MONOMER	=	TETRABUTYL TITANATE
BUTYL 2,4,5-TRICHLOROPHENOXYACETATE	=	2,4,5-T(ESTERS)
BUTYLTRICHLOROSILANE	=	BUTYLTRICHLOROSILANE
N-BUTYLTRICHLOROSILANE	=	BUTYLTRICHLOROSILANE
1,4-BUTYNEDIOL	=	1,4-BUTYNEDIOL
2-BUTYNE-1,4-DIOL	=	1,4-BUTYNEDIOL
BUTYRAL	=	N-BUTYRALDEHYDE
BUTYRALDEHYDE	=	N-BUTYRALDEHYDE
ISO-BUTYRALDEHYDE	=	ISO-BUTYRALDEHYDE
N-BUTYRALDEHYDE	=	N-BUTYRALDEHYDE
BUTYRIC ACID	=	N-BUTYRIC ACID
N-BUTYRIC ACID	=	N-BUTYRIC ACID
BUTYRIC ACID, ETHYL ESTER	=	ETHYL BUTYRATE
BUTYRIC ALDEHYDE	=	N-BUTYRALDEHYDE
BUTYRIC ETHER	=	ETHYL BUTYRATE
CACODYLIC ACID	=	CACODYLIC ACID
CADMIUM ACETATE	=	CADMIUM ACETATE
CADMIUM ACETATE DIHYDRATE	=	CADMIUM ACETATE
CADMIUM BROMIDE	=	CADMIUM BROMIDE
CADMIUM BROMIDE TETRAHYDRATE	=	CADMIUM BROMIDE
CADMIUM CHLORIDE	=	CADMIUM CHLORIDE
CADMIUM FLUOBORATE	=	CADMIUM FLUOROBORATE
CADMIUM FLUOROBORATE	=	CADMIUM FLUOROBORATE
CADMIUM FUME	=	CADMIUM OXIDE
CADMIUM NITRATE	=	CADMIUM NITRATE
CADMIUM NITRATE TETRAHYDRATE	=	CADMIUM NITRATE
CADMIUM OXIDE	=	CADMIUM OXIDE
CADMIUM SULFATE	=	CADMIUM SULFATE
CADOX HDP	=	CYCLOHEXANONE PEROXIDE
CADOX PS	=	DI-(P-CHLOROBENZOYL) PEROXIDE
CADOX TEH	=	TERT-BUTYL HYDROPEROXIDE
CAKE ALUM	=	ALUMINUM SULFATE
CALCIUM	=	CALCIUM PHOSPHATE
CALCIUM ABIETATE	=	CALCIUM RESINATE
CALCIUM ALKYLAROMATIC SULFONATE	=	DODECYLBENZENESULFONIC ACID,CALCIUM SALT
CALCIUM ALKYLBENZENESULFONATE	=	DODECYLBENZENESULFONIC ACID,CALCIUM SALT

SYNONYM		COMPOUND NAME
CALCIUM ARSENATE	=	CALCIUM ARSENATE
CALCIUM BIPHOSPHATE	=	CALCIUM PHOSPHATE
CALCIUM CARBIDE	=	CALCIUM CARBIDE
CALCIUM CHLORATE	=	CALCIUM CHLORATE
CALCIUM CHLORIDE	=	CALCIUM CHLORIDE
CALCIUM CHLORIDE HYDRATES	=	CALCIUM CHLORIDE
CALCIUM CHLORIDE,ANHYDROUS	=	CALCIUM CHLORIDE
CALCIUM CHROMATE	=	CALCIUM CHROMATE
CALCIUM CHROMATE DIHYDRATE	=	CALCIUM CHROMATE
CALCIUM CHROMATE (VI)	=	CALCIUM CHROMATE
CALCIUM CYANIDE	=	CALCIUM CYANIDE
CALCIUM DIOXIDE	=	CALCIUM PEROXIDE
CALCIUM FLUORIDE	=	CALCIUM FLUORIDE
CALCIUM HYDROXIDE	=	CALCIUM HYDROXIDE
CALCIUM HYPOCHLORITE	=	CALCIUM HYPOCHLORITE
CALCIUM MONOHYDROGEN PHOSPHATE	=	CALCIUM PHOSPHATE
CALCIUM, METALLIC	=	CALCIUM, METALLIC
CALCIUM NITRATE	=	CALCIUM NITRATE
CALCIUM NITRATE TETRAHYDRATE	=	CALCIUM NITRATE
CALCIUM OXIDE	=	CALCIUM OXIDE
CALCIUM PEROXIDE	=	CALCIUM PEROXIDE
CALCIUM PHOSPHATE	=	CALCIUM PHOSPHATE
CALCIUM PHOSPHATE,MONOBASIC,MONOHYDRATE	=	CALCIUM PHOSPHATE
CALCIUM PHOSPHIDE	=	CALCIUM PHOSPHIDE
CALCIUM RESINATE	=	CALCIUM RESINATE
CALCIUM RESINATE,FUSED	=	CALCIUM RESINATE
CALCIUM ROSIN	=	CALCIUM RESINATE
CALCIUM SUPERPHOSPHATE	=	CALCIUM PHOSPHATE
CALOCHLOR	=	MERCURIC CHLORIDE
CALOMEL	=	MERCUROUS CHLORIDE
CAMPHENE	=	CAMPHENE
CAMPHOR OIL	=	CAMPHOR OIL
CANE SUGAR	=	SUCROSE
CAPRALDEHYDE	=	DECALDEHYDE
CAPRIC ALCOHOL	=	N-DECYL ALCOHOL
CAPRIC ALDEHYDE	=	DECALDEHYDE
CAPROALDEHYDE	=	N-HEXALDEHYDE
CAPROIC ALDEHYDE	=	N-HEXALDEHYDE
E*SILON-CAPROLACTAM	=	CAPROLACTAM, LIQUID
CAPROLACTAM, LIQUID	=	CAPROLACTAM, LIQUID
CAPRONALDEHYDE	=	N-HEXALDEHYDE
N-CAPROYLALDEHYDE	=	N-HEXALDEHYDE
CAPRYLENE	=	1-OCTENE
CAPTAN	=	CAPTAN
CARBAMIDE	=	UREA
CARBAMIDE PEROXIDE	=	UREA PEROXIDE
CARBARYL	=	CARBARYL
CARBIDE	=	CALCIUM CARBIDE
CARBINOL	=	METHYL ALCOHOL
CARBITOL	=	DIETHYLENE GLYCOL MONOETHYL ETHER
CARBOBENZOXY CHLORIDE	=	BENZYL CHLOROFORMATE
CARBOLIC ACID	=	PHENOL
CARBOLIC OIL	=	CARBOLIC OIL
CARBON BISULFIDE	=	CARBON BISULFIDE
CARBON DIOXIDE	=	CARBON DIOXIDE
CARBON DISULFIDE	=	CARBON BISULFIDE
CARBONIC ACID DIETHYL ESTER	=	DIETHYL CARBONATE
CARBONIC ACID GAS	=	CARBON DIOXIDE
CARBONIC ACID, MONOAMMONIUM SALT	=	AMMONIUM BICARBONATE
CARBONIC ANHYDRIDE	=	CARBON DIOXIDE
CARBON MONOXIDE	=	CARBON MONOXIDE
CARBON TETRACHLORIDE	=	CARBON TETRACHLORIDE
CARBONYL CHLORIDE	=	PHOSGENE
CARBONYLDIAMIDE	=	UREA

SYNONYM		COMPOUND NAME
CARBONYL DIAMINE PEROXIDE	=	UREA PEROXIDE
CARBOXYBENZENE	=	BENZOIC ACID
CARENE	=	CARENE
3-CARENE	=	CARENE
CARPETING MATERIAL	=	ARSENIC ACID
CARPETING MEDIUM	=	ASPHALT BLEND STOCK: STRAIGHT RUN RESIDUE
CARTHAMUS TINCTORIUS OIL	=	OILS EDIBLE: SAFFLOWER
CARMINATE 125M	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
CATECHIN	=	CATECHOL
CATECHOL	=	CATECHOL
CAUSTIC ARSENIC CHLORIDE	=	ARSENIC TRICHLORIDE
CAUSTIC OIL OF ARSENIC	=	ARSENIC TRICHLORIDE
CAUSTIC POTASH	=	POTASSIUM HYDROXIDE
CAUSTIC POTASH SOLUTION	=	CAUSTIC POTASH SOLUTION
CAUSTIC SODA	=	SODIUM HYDROXIDE
CAUSTIC SODA SOLUTION	=	CAUSTIC SODA SOLUTION
CD-68	=	CHLORDANE
CELLOSOLVE	=	ETHYLENE GLYCOL MONOETHYL ETHER
CELLOSOLVE ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
CELLULOSE NITRATE SOLUTION	=	COLLODION
CETYL SODIUM SULFATE	=	HEXADECYL SULFATE, SODIUM SALT
CETYLTRIMETHYLAMMONIUM CHLORIDE SOLUTION	=	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE
CHAMBER ACID	=	SULFURIC ACID
CHARCOAL	=	CHARCOAL
CHEM BAM	=	NABAM
CHINESE TANNIN	=	TANNIC ACID
CHINOLINE	=	QUINOLINE
CHLORACETIC ACID	=	MONOCHLOROACETIC ACID
CHLORACETYL CHLORIDE	=	CHLOROACETYL CHLORIDE
CHLORATE OF POTASH	=	POTASSIUM CHLORATE
CHLORATE OF POTASSIUM	=	POTASSIUM CHLORATE
CHLORATE OF SODA	=	SODIUM CHLORATE
CHLORDAN	=	CHLORDANE
CHLORDANE	=	CHLORDANE
2-CHLORETHANOL	=	ETHYLENE CHLOROHYDRIN
CHLOREX	=	BIS(CHLOROETHYL) ETHER
CHLORIDE OF AMYL	=	N-AMYL CHLORIDE
CHLORINATED BIPHENYL	=	POLYCHLORINATED BIPHENYL (PCB)
CHLORINE	=	CHLORINE
CHLORINE TRIFLUORIDE	=	CHLORINE TRIFLUORIDE
CHLOROACETIC ACID	=	MONOCHLOROACETIC ACID
CHLOROACETIC ACID, ETHYL ESTER	=	ETHYL CHLOROACETATE
CHLOROACETOPHENONE	=	CHLOROACETOPHENONE
ALPHA-CHLOROACETOPHENONE	=	CHLOROACETOPHENONE
OMEGA-CHLOROACETOPHENONE	=	CHLOROACETOPHENONE
CHLOROACETYL CHLORIDE	=	CHLOROACETYL CHLORIDE
5-CHLORO-2-AMINOTOLUENE	=	4-CHLORO-O-TOLUIDINE
4-CHLOROANILINE	=	P-CHLOROANILINE
P-CHLOROANILINE	=	P-CHLOROANILINE
CHLOROBENZENE	=	CHLOROBENZENE
P-CHLOROBENZOYL PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
DI-(4-CHLOROBENZOYL)PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
4-CHLOROBUTYRONITRILE	=	4-CHLOROBUTYRONITRILE
4-CHLOROBUTYRONITRILE (PRACTICAL,MIXTURE WITH 4-BROMOBUTYRONITRILE)	=	4-CHLOROBUTYRONITRILE
CHLOROCARBONIC ACID, METHYL ESTER	=	METHYL CHLOROFORMATE
CHLORODIFLUOROMETHANE	=	MONOCHLORODIFLUOROMETHANE
1-CHLORO-2,3-EPOXYPROPANE	=	EPICHLORHYDRIN
CHLOROETHANE	=	ETHYL CHLORIDE
2-CHLOROETHANOL	=	ETHYLENE CHLOROHYDRIN
CHLOROETHENE	=	VINYL CHLORIDE

SYNONYM		COMPOUND NAME
2-CHLOROETHYL ALCOHOL	=	ETHYLENE CHLOROHYDRIN
2-CHLORO-4-ETHYLAMINO-6-ISOPROPYLAMINO-S-TRIAZINE	=	ATRAZINE
CHLOROETHYLENE	=	VINYL CHLORIDE
CHLOROFORM	=	CHLOROFORM
CHLOROFORMIC ACID, BENZYL ESTER	=	BENZYL CHLOROFORMATE
CHLOROFORMIC ACID, ETHYL ESTER	=	ETHYL CHLOROFORMATE
CHLOROFORMIC ACID, METHYL ESTER	=	METHYL CHLOROFORMATE
CHLOROFORMYL CHLORIDE	=	PHOSGENE
CHLOROHYDRINS (CRUDE)	=	CHLOROHYDRINS (CRUDE)
GAMMA-CHLOROISOBUTYLENE	=	METHALLYL CHLORIDE
CHLOROMETHANE	=	METHYL CHLORIDE
4-CHLORO-2-METHYLANILINE	=	4-CHLORO-O-TOLUIDINE
CHLOROMETHYL METHYL ETHER	=	CHLOROMETHYL METHYL ETHER
CHLOROMETHYLOXIRANE	=	EPICHLOROHYDRIN
O-(3-CHLORO-4-METHYL-2-OXO-(2H)-1-BENZOPYRAN-7-YL)PHOSPHOROTHIOATE	=	COUMAPHOS
4-CHLORO-O-TOLUIDINE	=	4-CHLORO-O-TOLUIDINE
CHLOROMETHYL PHENYL KETONE	=	CHLOROACETOPHENONE
3-CHLORO-2-METHYLPROPENE	=	METHALLYL CHLORIDE
1-CHLOROPENTANE	=	N-AMYL CHLORIDE
4-CHLOROPHENOL	=	P-CHLOROPHENOL
P-CHLOROPHENOL	=	P-CHLOROPHENOL
4-CHLOROPHENYLAMINE	=	P-CHLOROANILINE
DI-(P-CHLOROPHENYL)TRICHLOROMETHYLCARBINOL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
CHLOROPICRIN, LIQUID	=	CHLOROPICRIN, LIQUID
3-CHLOROPROPENE	=	ALLYL CHLORIDE
3-CHLOROPROPYLEN	=	ALLYL CHLORIDE
GAMMA-CHLOROPROPYLENE OXIDE	=	EPICHLOROHYDRIN
3-CHLORO-1,2-PROPYLENE OXIDE	=	EPICHLOROHYDRIN
CHLOROSULFONIC ACID	=	CHLOROSULFONIC ACID
CHLOROTHENE	=	TRICHLOROETHANE
CHLOROTOLUENE, ALPHA	=	BENZYL CHLORIDE
ALPHA-CHLOROTOLUENE	=	BENZYL CHLORIDE
OMEGA-CHLOROTOLUENE	=	BENZYL CHLORIDE
CHLOROTRIFLUOROETHYLENE	=	TRIFLUOROCHLOROETHYLENE
CHLOROTRIMETHYLSILANE	=	TRIMETHYLCHLOROSILANE
CHLORSULFONIC ACID	=	CHLOROSULFONIC ACID
CHLORYLEN	=	TRICHLOROETHYLENE
CHP	=	CUMENE HYDROPEROXIDE
CHROMIC ACID	=	CHROMIC ANHYDRIDE
CHROMIC ANHYDRIDE	=	CHROMIC ANHYDRIDE
CHROMIC OXIDE	=	CHROMIC ANHYDRIDE
CHROMIUM (VI) DIOXYCHLORIDE	=	CHROMYL CHLORIDE
CHROMIUM OXYCHLORIDE	=	CHROMYL CHLORIDE
CHROMIUM TRIOXIDE	=	CHROMIC ANHYDRIDE
CHROMYL CHLORIDE	=	CHROMYL CHLORIDE
CIANURINA	=	MERCURIC CYANIDE
CITRIC ACID	=	CITRIC ACID
CITRIC ACID, DIAMMONIUM SALT	=	AMMONIUM CITRATE
CLARIFIED OIL	=	OILS CLARIFIED
CLOROX	=	SODIUM HYPOCHLORITE
CC RAL	=	COUMAPHOS
COAL TAR OIL	=	OILS COAL TAR
COBALT ACETATE	=	COBALT ACETATE
COBALT ACETATE TETRAHYDRATE	=	COBALT ACETATE
COBALT (II) ACETATE	=	COBALT ACETATE
COBALT CHLORIDE	=	COBALT CHLORIDE
COBALT (II) CHLORIDE	=	COBALT CHLORIDE
COBALTOUS ACETATE	=	COBALT ACETATE
COBALTOUS CHLORIDE	=	COBALT CHLORIDE
COBALTOUS CHLORIDE DIHYDRATE	=	COBALT CHLORIDE
COBALTOUS CHLORIDE HEXAHYDRATE	=	COBALT CHLORIDE
COBALTOUS NITRATE	=	COBALT NITRATE

SYNONYM		COMPOUND NAME
COBALTOUS NITRATE HEXAHYDRATE	=	COBALT NITRATE
COBALTOUS SULFATE HEPTAHYDRATE	=	COBALT SULFATE
COBALT NITRATE	=	COBALT NITRATE
COBALT (II) NITRATE	=	COBALT NITRATE
COBALT SULFATE	=	COBALT SULFATE
COBALT (II) SULFATE	=	COBALT SULFATE
COCONUT BUTTER	=	OILS EDIBLE: COCONUT
COCONUT OIL	=	OILS EDIBLE: COCONUT
CODOIL	=	OIL: RESIN
CODOIL	=	OIL: ROSIN
COLLODION	=	COLLODION
COLOGNE SPIRIT	=	ETHYL ALCOHOL
COLONIAL SPIRIT	=	METHYL ALCOHOL
COLUMBIAN SPIRIT	=	METHYL ALCOHOL
COMBUSTION IMPROVER C12	=	METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL
CONDENSED PHOSPHORIC ACID	=	POLYPHOSPHORIC ACID
COPPER ACETATE	=	COPPER ACETATE
COPPER ACETOARSENITE	=	COPPER ACETOARSENITE
COPPER ARSENITE	=	COPPER ARSENITE
COPPERAS	=	FERROUS SULFATE
COPPER BO[illegible]FLUORIDE SOLUTION	=	COPPER FLUOROBORATE
COPPER BRO[illegible]DE	=	COPPER BROMIDE
COPPER CHLORIDE	=	COPPER CHLORIDE
COPPER CYANIDE	=	COPPER CYANIDE
COPPER FLUOROBORATE	=	COPPER FLUOROBORATE
COPPER(II)FLUOBORATE SOLUTION	=	COPPER FLUOROBORATE
COPPER IODIDE	=	COPPER IODIDE
COPPER NAPHTHENATE	=	COPPER NAPHTHENATE
COPPER NITRATE	=	COPPER NITRATE
COPPER ORTHOARSENITE	=	COPPER ARSENITE
COPPER OXALATE	=	COPPER OXALATE
COPPER SULFATE	=	COPPER SULFATE
COPPER SULFATE PENTAHYDRATE	=	COPPER SULFATE
COPRA OIL	=	OILS EDIBLE: COCONUT
CORN SUGAR SOLUTION	=	DEXTROSE SOLUTION
CORN SYRUP	=	CORN SYRUP
CORN SYRUP SOLUTION	=	DEXTROSE SOLUTION
CORROSIVE MERCURY CHLORIDE	=	MERCURIC CHLORIDE
CORROSIVE SUBLIMATE	=	MERCURIC CHLORIDE
COTTONSEED OIL	=	OIL: COTTONSEED
COUMAPHOS	=	COUMAPHOS
CRANKCASE OIL	=	OIL: MOTOR
CRANKCASE OIL	=	OIL: LUBRICATING
CREOSOTE, COAL TAR	=	CREOSOTE, COAL TAR
CREOSOTE OIL	=	CREOSOTE, COAL TAR
CRESOL,EPOXYPROPYL ETHER	=	CRESYL GLYCIDYL ETHER
CRESOLS	=	CRESOLS
CRESYL GLYCIDYL ETHER	=	CRESYL GLYCIDYL ETHER
CRESYLIC ACID	=	XYLENOL
CRESYLIC ACIDS	=	CRESOLS
CROPLAS EH	=	ETHYL HEXYL TALLATE
CROTENALDEHYDE	=	CROTONALDEHYDE
CROTONALDEHYDE	=	CROTONALDEHYDE
CROTONIC ALDEHYDE	=	CROTONALDEHYDE
CROTONOEL	=	OILS MISCELLANEOUS: CROTON
CROTON TIGLIUM L. OIL	=	OILS MISCELLANEOUS: CROTON
CRUDE EPICHLOROHYDRIN	=	CHLOROHYDRINS (CRUDE)
CRUDE OIL	=	OIL: CRUDE
CRYSTALLIZED VERDIGRIS	=	COPPER ACETATE
CTF	=	CHLORINE TRIFLUORIDE
CUCUMBER DUST	=	CALCIUM ARSENATE
CUMENE	=	CUMENE
CUMENE HYDROPEROXIDE	=	CUMENE HYDROPEROXIDE
CUMOL	=	CUMENE

SYNONYM		COMPOUND NAME
CUMYL HYDROPEROXIDE	=	CUMENE HYDROPEROXIDE
CUPRIC ACETATE MONOHYDRATE	=	COPPER ACETATE
CUPRIC ARSENITE	=	COPPER ARSENITE
CUPRIC BROMIDE, ANHYDROUS	=	COPPER BROMIDE
CUPRIC CHLORIDE DIHYDRATE	=	COPPER CHLORIDE
CUPRIC FLUOBORATE SOLUTION	=	COPPER FLUOROBORATE
CUPRIC GREEN	=	COPPER ARSENITE
CUPRICIN	=	COPPER CYANIDE
CUPRIC NITRATE TRIHYDRATE	=	COPPER NITRATE
CUPRIC OXALATE HEMIHYDRATE	=	COPPER OXALATE
CUPRIC SULFATE	=	COPPER SULFATE
CUPRIETHYLENEDIAMINE SOLUTION	=	CUPRIETHYLENEDIAMINE SOLUTION
CUPRIETHYLENEDIAMINE HYDROXIDE SOLUTION	=	CUPRIETHYLENEDIAMINE SOLUTION
CUPROUS CYANIDE	=	COPPER CYANIDE
CUPROUS IODIDE	=	COPPER IODIDE
CYANACETIC ACID	=	CYANOACETIC ACID
CYANIDE	=	POTASSIUM CYANIDE
CYANIDE OF CALCIUM	=	CALCIUM CYANIDE
CYANOACETIC ACID	=	CYANOACETIC ACID
CYANOBENZENE	=	BENZONITRILE
2-CYANOETHANOL	=	ETHYLENE CYANOHYDRIN
CYANOETHYLENE	=	ACRYLONITRILE
CYANOGAS A-DUST	=	CALCIUM CYANIDE
CYANOGAS G-FUMIGANT	=	CALCIUM CYANIDE
CYANOGEN	=	CYANOGEN
CYANOGEN BROMIDE	=	CYANOGEN BROMIDE
CYANOGEN CHLORIDE	=	CYANOGEN CHLORIDE
CYANOMETHANE	=	ACETONITRILE
CYCLOHEXANE	=	CYCLOHEXANE
CYCLOHEXANOL	=	CYCLOHEXANOL
CYCLOHEXANONE	=	CYCLOHEXANONE
CYCLOHEXANONE PEROXIDE	=	CYCLOHEXANONE PEROXIDE
CYCLOHEXENYLTRICHLOROSILANE	=	CYCLOHEXENYLTRICHLOROSILANE
CYCLOHEXYL ALCOHOL	=	CYCLOHEXANOL
CYCLOHEXYLAMINE	=	CYCLOHEXYLAMINE
CYCLOHEXYL KETONE	=	CYCLOHEXANONE
CYCLOPENTANE	=	CYCLOPENTANE
CYCLOPENTANE, METHYL	=	METHYLCYCLOPENTANE
CYCLOPROPANE	=	CYCLOPROPANE
P-CYMENE	=	P-CYMENE
CYMOL	=	P-CYMENE
CYSTOGEN	=	HEXAMETHYLENETETRAMINE
CYTHION INSECTICIDE	=	MALATHION
2,4-D	=	2,4-DICHLOROPHENOXYACETIC ACID
DALAPON	=	DALAPON
DBP	=	DIBUTYL PHTHALATE
DCEE	=	DICHLOROETHYL ETHER
DCP	=	CALCIUM PHOSPHATE
DDD	=	DDD
DDT	=	DDT
P,P -DDT	=	DDT
D.D. TURPENTINE	=	TURPENTINE
DEA	=	DIETHANOLAMINE
DEAD OIL	=	CREOSOTE, COAL TAR
DEC	=	DECAHYDRONAPHTHALENE
DECABORANE	=	DECABORANE
DECAHYDRONAPHTHALENE CIS-OR TRANS-DECAHYDRONAPHTHALENE	=	DECAHYDRONAPHTHALENE
DECALDEHYDE	=	DECALDEHYDE
DECALIN	=	DECAHYDRONAPHTHALENE
DECANAL	=	DECALDEHYDE
1-DECANOL	=	N-DECYL ALCOHOL

SYNONYM		COMPOUND NAME
1-DECENE	=	1-DECENE
ALPHA-DECENE	=	1-DECENE
N-DECYL ALCOHOL	=	N-DECYL ALCOHOL
N-DECYL ALDEHYDE	=	DECALDEHYDE
DECYLBENZENE	=	N-DECYLBENZENE
N-DECYLBENZENE	=	N-DECYLBENZENE
DEG	=	DIETHYLENE GLYCOL
DEHD	=	DIOCTYL PHTHALATE
DEHPA	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DEHYDRITE	=	MAGNESIUM PERCHLORATE
DE KALIN	=	DECAHYDRONAPHTHALENE
DEMETON	=	DEMETON
DEN	=	DIETHYLAMINE
DENATURED ALCOHOL	=	ETHYL ALCOHOL
2,4-D ESTERS	=	2,4-D ESTERS
DETERGENT ALKYLATE =2	=	DODECYLBENZENE
DEXTROSE SOLUTION	=	DEXTROSE SOLUTION
DIACETIC ETHER	=	ETHYL ACETOACETATE
DIACETONE	=	DIACETONE ALCOHOL
DIACETONE ALCOHOL	=	DIACETONE ALCOHOL
DIACETYLMETHANE	=	ACETYLACETONE
DIACETYL PEROXIDE SOLUTION	=	ACETYL PEROXIDE SOLUTION
1,2-DIAMINOETHANE	=	ETHYLENEDIAMINE
2,2 -DIAMINODIETHYLAMINE	=	DIETHYLENETRIAMINE
1,6-DIAMINOHEXANE	=	HEXAMETHYLENEDIAMINE
1,11-DIAMINO-3,6,9-TRIAZAUNDECANE	=	TETRAETHYLENEPENTAMINE
DIAMMONIUM CITRATE	=	AMMONIUM CITRATE
DIAMMONIUM HYDROGEN PHOSPHATE	=	AMMONIUM PHOSPHATE
DIAMMONIUM ORTHOPHOSPHATE	=	AMMONIUM PHOSPHATE
DIAMMONIUM OXALATE	=	AMMONIUM OXALATE
DIAMYL PHTHALATE	=	DI-N-AMYL PHTHALATE
DI-N-AMYL PHTHALATE	=	DI-N-AMYL PHTHALATE
2,2-DI-(P-ANISYL)-1,1,1-TRICHLOROETHANE	=	METHOXYCHLOR
DIANTIMONY TROXIDE	=	ANTIMONY TRIOXIDE
DIAZINON	=	DIAZINON
DIBASIC CALCIUM PHOSPHATE	=	CALCIUM PHOSPHATE
DIBENZO(B,E)PYRIDINE	=	ACRIDINE
DIBENZOYL PEROXIDE	=	DIBENZOYL PEROXIDE
DIBK	=	DIISOBUTYL KETONE
1,2-DIBROMOETHANE	=	ETHYLENE DIBROMIDE
SYM-DIBROMOETHANE	=	ETHYLENE DIBROMIDE
DIBUTYLAMINE	=	DI-N-BUTYLAMINE
DI-N-BUTYLAMINE	=	DI-N-BUTYLAMINE
DIBUTYL ETHER	=	DI-N-BUTYL ETHER
N-DIBUTYL ETHER	=	DI-N-BUTYL ETHER
DI-N-BUTYL ETHER	=	DI-N-BUTYL ETHER
DI-N-BUTYL KETONE	=	DI-N-BUTYL KETONE
DIBUTYL OXIDE	=	DI-N-BUTYL ETHER
DIBUTYLPHENOL	=	DIBUTYLPHENOL
2,6-DI-TERT-BUTYLPHENOL	=	DIBUTYLPHENOL
DIBUTYL PHTHALATE	=	DIBUTYL PHTHALATE
DICALCIUM PHOSPHATE (ANHYDROUS OR DIHYDRATE)	=	CALCIUM PHOSPHATE
S-(1,2-DICARBETHOXYETHYL)-O,O-DIMETHYL DITHIOPHOSPHATE	=	MALATHION
DICARBOMETHOXYZINC	=	ZINC ACETATE
DICHLORICIDE	=	P-DICHLOROBENZENE
1,2-DICHLOROBENZENE	=	O-DICHLOROBENZENE
O-DICHLOROBENZENE	=	O-DICHLOROBENZENE
P-DICHLOROBENZENE	=	P-DICHLOROBENZENE
DI-(P-CHLOROBENZOYL) PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
DI-(4-CHLOROBENZOYL) PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
P,P -DICHLOROBENZOYL PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
1,1-DICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE	=	DDD

SYNONYM		COMPOUND NAME
DICHLOROBUTENE	=	DICHLOROBUTENE
1,4-DICHLORO-2-BUTENE	=	DICHLOROBUTENE
CIS-1,4-DICHLORO-2-BUTENE	=	DICHLOROBUTENE
TRANS-1,4-DICHLORO-2-BUTENE	=	DICHLOROBUTENE
1,4-DICHLORO-2-BUTYLENE	=	DICHLOROBUTENE
DICHLORODIETHYL ETHER	=	DICHLOROETHYL ETHER
DICHLORODIFLUOROMETHANE	=	DICHLORODIFLUOROMETHANE
DICHLORODIPHENYLDICHLOROETHANE	=	DDD
DICHLORODIPHENYLSILANE	=	DIPHENYLDICHLOROSILANE
DICHLORODIPHENYLSILICANE	=	DIPHENYLDICHLOROSILANE
DICHLORODIPHENYLTRICHLOROETHANE	=	DDT
1,2-DICHLOROETHANE	=	ETHYLENE DICHLORIDE
DI-(2-CHLOROETHYL)ETHER	=	DICHLOROETHYL ETHER
DI-(2-CHLOROETHYL) ETHER	=	DICHLOROETHYL ETHER
DICHLOROETHYL ETHER	=	DICHLOROETHYL ETHER
1,1-DICHLOROETHYLENE	=	VINYLIDENECHLORIDE, INHIBITED
1,2-DICHLOROETHYLENE	=	1,2-DICHLOROETHYLENE
SYM-DICHLOROETHYLENE	=	1,2-DICHLOROETHYLENE
UNSYM-DICHLOROETHYLENE	=	VINYLIDENECHLORIDE, INHIBITED
CIS-OR TRANS-1,2-DICHLOROETHYLENE	=	1,2-DICHLOROETHYLENE
2,2 -DICHLOROETHYL ETHER	=	DICHLOROETHYL ETHER
BETA, BETA - DICHLOROETHYL ETHER	=	DICHLOROETHYL ETHER
DICHLOROMETHANE	=	DICHLOROMETHANE
2,4-DICHLOROPHENOL	=	2,4-DICHLOROPHENOL
2,4-DICHLOROPHENOXYACETIC ACID	=	2,4-DICHLOROPHENOXYACETIC ACID
2,4-DICHLOROPHENOXYACETIC ACID, BUTOXYETHYL ESTER	=	2,4-D ESTERS
2,4-DICHLOROPHENOXYACETIC ACID, BUTYL ESTER	=	2,4-D ESTERS
2,4-DICHLOROPHENOXYACETIC ACID,ISOPROPYL ESTER	=	2,4-D ESTERS
DICHLOROPHENYLPHOSPHINE	=	BENZENE PHOSPHORUS DICHLORIDE
DI-(P-CHLOROPHENYL) TRICHLOROMETHYLCARBINOL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
1,2-DICHLOROPROPANE	=	DICHLOROPROPANE
DICHLOROPROPANE	=	DICHLOROPROPANE
2,2-DICHLOROPROPANOIC ACID	=	DALAPON
ALPHA, ALPHA -DICHLOROPROPIONIC ACID	=	DALAPON
1,3-DICHLOROPROPENE	=	DICHLOROPROPENE
DICHLOROPROPENE	=	DICHLOROPROPENE
2,2-DICHLOROPROPIONIC ACID	=	DALAPON
4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
DICOFOL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
DICY	=	DICYCLOPENTADIENE
DICYAN	=	CYANOGEN
1,4-DICYANOBUTANE	=	ADIPONITRILE
DICYANOGEN	=	CYANOGEN
DICYCLOHEXANONE DIPEROXIDE	=	CYCLOHEXANONE PEROXIDE
DICYCLOPENTADIENE	=	DICYCLOPENTADIENE
DIELDRIN	=	DIELDRIN
DIESEL IGNITION IMPROVER	=	N-AMYL NITRATE
DIESEL OIL, LIGHT	=	FUEL OIL: 1-D
DIESEL OIL, MEDIUM	=	FUEL OIL: 2-D
DIETHANOLAMINE	=	DIETHANOLAMINE
DIETHANOLAMINE, LAURYL SULFATE SOLUTION--LAURYL SULFATE,DIETHANOLAMINE SALT SOLUTION	=	DODECYL SULFATE, DIETHANOLAMINE SALT
DIETHANOLAMINE LAURYL SULFATE SOLUTION LAURYL SULFATE, DIETHANOLAMINE SALT	=	DODECYL SULFATE, DIETHANOLAMINE SALT

SYNONYM		COMPOUND NAME
1,2-DIETHOXYETHANE	=	ETHYLENE GLYCOL DIETHYL ETHER
DIETHYLAMINE	=	DIETHYLAMINE
DIETHYLBENZENE	=	DIETHYLBENZENE
DIETHYL CARBONATE	=	DIETHYL CARBONATE
DIETHYL CELLOSOLVE	=	ETHYLENE GLYCOL DIETHYL ETHER
O,O-DIETHYL-O-(3-CHLORO-4-METHYL-2-OXO-(2H)-1-BENZOPYRAN-7-YL)PHOSPHOROTHIOATE	=	COUMAPHOS
DIETHYLENEDIAMINE	=	PIPERAZINE
DIETHYLENE GLYCOL	=	DIETHYLENE GLYCOL
DIETHYLENE GLYCOL DIMETHYL ETHER	=	DIETHYLENE GLYCOL DIMETHYL ETHER
DIETHYLENE GLYCOL ETHYL ETHER	=	DIETHYLENE GLYCOL MONOETHYL ETHER
DIETHYLENE GLYCOL METHYL ETHER	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
DIETHYLENE GLYCOL MONOBUTYL ETHER	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	=	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
DIETHYLENE GLYCOL MONOETHYL ETHER	=	DIETHYLENE GLYCOL MONOETHYL ETHER
DIETHYLENE GLYCOL MONOMETHYL ETHER	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
DIETHYLENEIMIDE OXIDE	=	MORPHOLINE
DIETHYLENE IMIDOXIDE	=	MORPHOLINE
DI(ETHYLENE OXIDE)	=	1,4-DIOXANE
DIETHYLENE OXIMIDE	=	MORPHOLINE
DIETHYLENETRIAMINE	=	DIETHYLENETRIAMINE
DIETHYL ETHER	=	ETHYL ETHER
DI-(2-ETHYLHEXYL) ACID PHOSPHATE	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DI(2-ETHYLHEXYL)ADIPATE	=	DIOCTYL ADIPATE
DI-(2-ETHYLHEXYL) PHOSPHATE	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DI-(2-ETHYLHEXYL) PHOSPHORIC ACID	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DI(2-ETHYLHEXYL)PHTHALATE	=	DIOCTYL PHTHALATE
DI-(2-ETHYLHEXYL)SULFOSUCCINATE, SODIUM SALT	=	DIOCTYL SODIUM SULFOSUCCINATE
O,O-DIETHYL O-(2-ISOPROPYL-6-METHYL-4-PYRIMIDINYL) PHOSPHOROTHICATE	=	DIAZINON
O,O-DIETHYL-O-(2-ISOPROPYL-6-METHYL-4-PYRIMIDINYL)PHOSPHOROTHIOATE	=	DIAZINON
O,O-DIETHYL O-2-ISOPROPYL-4-METHYL-6-PYRIMIDYL THIO-PHOSPHATE	=	DIAZINON
O,O-DIETHYL-O-(2-ISOPROPYL-6-METHYL-4-PYRIMIDINYL)THIOPHOSPHATE	=	DIAZINON
DIETHYL 2-ISOPROPYL-4-METHYL-6-PYRIMIDYL THIONOPHOSPHATE	=	DIAZINON
O,O-DIETHYL O-(P-NITROPHENYL) PHOSPHOROTHIOATE	=	PARATHION, LIQUID
O,O-DIETHYL O-(P-NITROPHENYL) THIOPHOSPHATE	=	PARATHION, LIQUID
O,O-DIETHYL-S(AND S-)(1-(ETHYLTHIO)ETHYL)PHOSPHOROTHIOATES	=	DEMETON
DIETHYL OXIDE	=	ETHYL ETHER
DIETHYL PHTHALATE	=	DIETHYL PHTHALATE
DIETHYLZINC	=	DIETHYLZINC
1,1-DIFLUOROETHANE	=	1,1-DIFLUOROETHANE
DIFLUOROPHOSPHORUS ACID	=	DIFLUOROPHOSPHORIC ACID, ANHYDROUS
DIFLUOROPHOSPHORIC ACID, ANHYDROUS	=	DIFLUOROPHOSPHORIC ACID, ANHYDROUS
DIFORMYL	=	GLYOXAL, 40% SOLUTION
DIGLYCOL	=	DIETHYLENE GLYCOL
DIGLYCOL MONOBUTYL ETHER	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
DIGLYCOL MONOBUTYL ETHER ACETATE	=	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
DIGLYME	=	DIETHYLENE GLYCOL DIMETHYL ETHER
DIHEPTYL PHTHALATE	=	DIHEPTYL PHTHALATE
DIHYDRATE	=	CADMIUM ACETATE
2,5-DIHYDROPEROXY-2,5-DIMETHYLHEXANE	=	DIMETHYLHEXANE DIHYDROPEROXIDE, WET
1,2-DIHYDRO-3,6-PYRIDAZINEDIONE	=	MALEIC HYDRAZIDE
1,2-DIHYDROXYBENZENE	=	CATECHOL
1,3-DIHYDROXYBENZENE	=	RESORCINOL

SYNONYM		COMPOUND NAME
M-DIHYDROXYBENZENE	=	RESORCINOL
P-DIHYDROXYBENZENE	=	HYDROQUINONE
DIHYDROXYBENZOL	=	RESORCINOL
1,4-DIHYDROXYBUTANE	=	1,4-BUTANEDIOL
1,4-DIHYDROXY-2-BUTENE	=	1,4-BUTENEDIOL
1,4-DIHYDROXY-2-BUTYNE	=	1,4-BUTYNEDIOL
2,2 -DIHYDROXYDIETHYL AMINE	=	DIETHANOLAMINE
BETA,BETA - DIHYDROXYDIETHYL ETHER	=	DIETHYLENE GLYCOL
P,P -DIHYDROXYDIPHENYLDIMETHYLMETHANE	=	BISPHENOL A
2,2 -DIHYDROXYDIPROPYLAMINE	=	DIISOPROPANOLAMINE
1,2-DIHYDROXYETHANE	=	ETHYLENE GLYCOL
DI-BETA-HYDROXYETHOXYETHANE	=	TRIETHYLENE GLYCOL
DI(2-HYDROXYETHYL)AMINE	=	DIETHANOLAMINE
DIHYDROXYETHYL ETHER	=	DIETHYLENE GLYCOL
1,2-DIHYDROXYPROPANE	=	PROPYLENE GYLCOL
DIISOBUTYLENE	=	DIISOBUTYLENE
DIISOBUTYLCARBINOL	=	DIISOBUTYLCARBINOL
DIISOBUTYL KETONE	=	DIISOBUTYL KETONE
I,J-DIISOCYANATOTOLUENE	=	TOLUENE 2,4-DIISOCYANATE (TDI)
DIISODECYL PHTHALATE	=	DIISODECYL PHTHALATE
DIISOPROPANOLAMINE	=	DIISOPROPANOLAMINE
DIISOPROPYL ETHER	=	ISOPROPYL ETHER
DIISOPROPYL OXIDE	=	ISOPROPYL ETHER
DIISOPROPYL PERCARBONATE	=	ISOPROPYL PERCARBONATE
DIISOPROPYL PEROXYDICARBONATE	=	ISOPROPYL PERCARBONATE
SYM-DIISOPROPYLACETONE	=	DIISOBUTYL KETONE
DIISOPROPYLAMINE	=	DIISOPROPYLAMINE
DIISOPROPYLBENZENE HYDROPEROXIDE	=	DIISOPROPYLBENZENE HYDROPEROXIDE
DILAUROYL PEROXIDE	=	LAUROYL PEROXIDE
DIMAZINE	=	1,1-DIMETHYLHYDRAZINE
5,8-DIMETHANONAPHTHALENE	=	ENDRIN
1,2-DIMETHOXYETHANE	=	ETHYLENE GLYCOL DIMETHYL ETHER
DIMETHOXYMETHANE	=	METHYL FORMAL
10,11-DIMETHOXYSTRYCHNINE	=	BRUCINE
DIMETHYLACETAMIDE	=	DIMETHYLACETAMIDE
N,N-DIMETHYLACETAMIDE	=	DIMETHYLACETAMIDE
N,N-DIMETHYLACETAMIDE ACETIC ACID, DIMETHYLAMIDE	=	DIMETHYLACETAMIDE
DIMETHYLACETIC ACID	=	ISOBUTYRIC ACID
DIMETHYLAMINE	=	DIMETHYLAMINE
DIMETHYLARSINIC ACID	=	CACODYLIC ACID
1,3-DIMETHYLBENZENE	=	M-XYLENE
1,4-DIMETHYLBENZENE	=	P-XYLENE
1,2-DIMETHYLBENZENE	=	O-XYLENE
ALPHA, ALPHA- DIMETHYLBENZENE HYDROPEROXIDE	=	CUMENE HYDROPEROXIDE
DIMETHYLBENZYL HYDROPEROXIDE	=	CUMENE HYDROPEROXIDE
DIMETHYLBENZYLOCTADECYLAMMONIUM CHLORIDE	=	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
2,2-DIMETHYLBUTANE	=	NEOHEXANE
DIMETHYLCARBINOL	=	ISOPROPYL ALCOHOL
DIMETHYL CELLOSOLVE	=	ETHYLENE GLYCOL DIMETHYL ETHER
DIMETHYLDICHLOROSILANE	=	DIMETHYLDICHLOROSILANE
DIMETHYL ETHER	=	DIMETHYL ETHER
1,1-DIMETHYLETHYLAMINE	=	TERT-BUTYLAMINE
DIMETHYLFORMAL	=	METHYL FORMAL
DIMETHYLFORMAMIDE	=	DIMETHYLFORMAMIDE
N,N-DIMETHYLFORMAMIDE	=	DIMETHYLFORMAMIDE
2,6-DIMETHYL-4-HEPTANONE	=	DIISOBUTYL KETONE
2,6-DIMETHYL-4-HEPTANOL	=	DIISOBUTYLCARBINOL
DIMETHYLHEXANALS	=	ISOOCTALDEHYDE
DIMETHYLHEXANE DIHYDROPEROXIDE, WET	=	DIMETHYLHEXANE DIHYDROPEROXIDE, WET
2,5-DIMETHYLHEXANE-2,5-DIHYDROPEROXIDE	=	DIMETHYLHEXANE DIHYDROPEROXIDE, WET

SYNONYM		COMPOUND NAME
DIMETHYL-1-HEXANOLS	=	ISOOCTYL ALCOHOL
1,1-DIMETHYLHYDRAZINE	=	1,1-DIMETHYLHYDRAZINE
UNSYM-DIMETHYLHYDRAZINE	=	1,1-DIMETHYLHYDRAZINE
DIMETHYL KETONE	=	ACETONE
DIMETHYLMETHANE	=	PROPANE
2,2-DIMETHYL-3-METHYLENENORBORNANE	=	CAMPHENE
3,3-DIMETHYL-2-METHYLENENORCAMPHANE	=	CAMPHENE
DIMETHYLOCTADECYLBENZYLAMMONIUM CHLORIDE	=	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
O,O-DIMETHYL-O-(P-NITROPHENYL)PHOSPHOROTHIOATE	=	METHYL PARATHION
O,O-DIMETHYL-O-(P-NITROPHENYL)THIOPHOSPHATE	=	METHYL PARATHION
O, O-DIMETHYL S-\\4-OXO-1,2,3-BENZOTRIAZINE-3\4H*-YL*METHYL* PHOSPHORODITHIOATE	=	AZINPHOSMETHYL
2,6-DIMETHYLPHENOL	=	XYLENOL
DIMETHYL POLYSILOXANE	=	DIMETHYL POLYSILOXANE
DIMETHYL SILICONE FLUIDS	=	DIMETHYL POLYSILOXANE
DIMETHYLSILICONE OIL	=	DIMETHYL POLYSILOXANE
DIMETHYL SULFATE	=	DIMETHYL SULFATE
DIMETHYL SULFIDE	=	DIMETHYL SULFIDE
DIMETHYL SULFOXIDE	=	DIMETHYL SULFOXIDE
DIMETHYL TEREPHTHALATE	=	DIMETHYL TEREPHTHALATE
DIMETHYLZINC	=	DIMETHYLZINC
2,4-DINITRANILINE	=	2,4-DINITROANILINE
2,4-DINITROANILINE	=	2,4-DINITROANILINE
1,3-DINITROBENZENE	=	M-DINITROBENZENE
M-DINITROBENZENE	=	M-DINITROBENZENE
META-DINITROBENZENE	=	M-DINITROBENZENE
DINITROBENZOL	=	M-DINITROBENZENE
1,3-DINITROBENZOL	=	M-DINITROBENZENE
DINITROCRESOLS	=	DINITROCRESOLS
3,5-DINITRO-O-CRESOL	=	DINITROCRESOLS
4,6-DINITRO-O-CRESOL	=	DINITROCRESOLS
2,6-DINITRO-P-CRESOL	=	DINITROCRESOLS
2,6-DINITRO-N,N-DIPROPYL-4-TRIFLUOROMETHYLANILINE	=	TRIFLURALIN
2,6-DINITRO-N,N-DIPROPYL-ALPHA,ALPHA,ALPHA-TRIFLUORO-P-TOLUIDINE	=	TRIFLURALIN
DINITROGEN MONOXIDE	=	NITROUS OXIDE
DINITROGEN TETROXIDE	=	NITROGEN TETROXIDE
ALPHA-DINITROPHENOL	=	2,4-DINITROPHENOL
2,4-DINITROPHENOL	=	2,4-DINITROPHENOL
2,4-DINITROTOLUENE	=	2,4-DINITROTOLUENE
2,4-DINITROTOLUOL	=	2,4-DINITROTOLUENE
DIOCTYL ADIPATE	=	DIOCTYL ADIPATE
DIOCTYL PHTHALATE	=	DIOCTYL PHTHALATE
DIOCTYL SODIUM SULFOSUCCINATE	=	DIOCTYL SODIUM SULFOSUCCINATE
DICFORM	=	1,2-DICHLOROETHYLENE
DIOXAN	=	1,4-DIOXANE
1,4-DIOXANE	=	1,4-DIOXANE
P-DIOXANE	=	1,4-DIOXANE
DIOXONIUM PERCHLORATE SOLUTION	=	PERCHLORIC ACID
1,3-DIOXOPHTHALAN	=	PHTHALIC ANHYDRIDE
DIPENTENE	=	DIPENTENE
DIPENTYL PHTHALATE	=	DI-N-AMYL PHTHALATE
DIPHENYLAMINE	=	DIPHENYLAMINE
DIPHENYLDICHLOROSILANE	=	DIPHENYLDICHLOROSILANE
DIPHENYL ETHER	=	DIPHENYL ETHER
DIPHENYL KETONE	=	BENZOPHENONE
DIPHENYLMETHANEDIISOCYANATE (MDI)	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
DIPHENYLMETHANE-4,4 -DIISOCYANATE	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
DIPHENYL METHANONE	=	BENZOPHENONE

SYNONYM		COMPOUND NAME
DIPHENYL OXIDE	=	DIPHENYL ETHER
DIPHENYLSILICON DICHLORIDE	=	DIPHENYLDICHLOROSILANE
DI-N-PROPYLAMINE	=	DI-N-PROPYLAMINE
N,N-DIPROPYL-2,6-DINITRO-4-TRIFLUORO-METHYLANILINE	=	TRIFLURALIN
DIPROPYLENE GLYCOL	=	DIPROPYLENE GLYCOL
DISODIUM ARSENATE HEPTAHYDRATE	=	SODIUM ARSENATE
DISODIUM ETHYLENEBIS (DITHIOCARBAMATE)	=	NABAM
DISODIUM METHANEARSONATE	=	METHANEARSONIC ACID, SODIUM SALTS
DISODIUM METHYL ARSONATE	=	METHANEARSONIC ACID, SODIUM SALTS
DISODIUM NITRILOTRIACETATE	=	NITRILOTRIACETIC ACID AND SALTS
DISTILLATE:FLASHED FEED STOCKS	=	DISTILLATE:FLASHED FEED STOCKS
DISTILLATE:STRAIGHT RUN	=	DISTILLATE:STRAIGHT RUN
DISULFATOZIRCONIC ACID	=	ZIRCONIUM SULFATE
DITHANE	=	NABAM
DITHIOPYROPHOSPHORIC ACID,O,O,O,O-TETRAETHYL ESTER	=	TETRAETHYL DITHIOPYROPHOSPHATE
DIVINYL	=	BUTADIENE, INHIBITED
DMDT	=	METHOXYCHLOR
DMF	=	DIMETHYLFORMAMIDE
DMS	=	DIMETHYL SULFIDE
DMSO	=	DIMETHYL SULFOXIDE
DNT	=	2,4-DINITROTOLUENE
DOA	=	DIOCTYL ADIPATE
1-DODECANETHIOL	=	LAURYL MERCAPTAN
DODECANOL	=	LINEAR ALCOHOLS (12-15 CARBONS)
DODECANOL	=	DODECANOL
DODECANOYL PEROXIDE	=	LAUROYL PEROXIDE
DODECENE	=	DODECENE
1-DODECENE	=	1-DODECENE
DODECENE (NON-LINEAR)	=	PROPYLENE TETRAMER
DODECENE (NON-LINEAR)	=	DODECENE
DODECYL ALCOHOL	=	DODECANOL
DODECYLBENZENE	=	DODECYLBENZENE
N-DODECYLBENZENE	=	DODECYLBENZENE
DODECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
DODECYLBENZENE (LINEAR)	=	DODECYLBENZENE
DODECYLBENZENESULFONIC ACID,CALCIUM SALT	=	DODECYLBENZENESULFONIC ACID,CALCIUM SALT
DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT	=	DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT
DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT	=	DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT
ALPHA-DODECYLENE	=	1-DODECENE
DODECYLETHYLENE	=	1-TETRADECENE
DODECYL MERCAPTAN	=	LAURYL MERCAPTAN
DODECYL SULFATE, AMMONIUM SALT	=	AMMONIUM LAURYL SULFATE
DODECYL SULFATE, DIETHANOLAMINE SALT	=	DODECYL SULFATE, DIETHANOLAMINE SALT
DODECYL SULFATE, MAGNESIUM SALT	=	DODECYL SULFATE, MAGNESIUM SALT
DODECYL SULFATE, SODIUM SALT	=	DODECYL SULFATE, SODIUM SALT
DODECYL SULFATE, TRIETHANOLAMINE SALT	=	DODECYL SULFATE, TRIETHANOLAMINE SALT
DODECYLTRICHLOROSILANE	=	DODECYLTRICHLOROSILANE
DOP	=	DIOCTYL PHTHALATE
DORMANT OIL	=	OIL: SPRAY
DOWANOL DB	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
DOWANOL DE	=	DIETHYLENE GLYCOL MONOETHYL ETHER
DOWANOL DM	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
DOWANOL EB	=	ETHYLENE GLYCOL MONOBUTYL ETHER
DOWANOL EE	=	ETHYLENE GLYCOL MONOETHYL ETHER
DOWANOL EM	=	ETHYLENE GLYCOL MONOMETHYL ETHER
DOWANOL PM	=	PROPYLENE GLYCOL METHYL ETHER
DOWANOL TE	=	ETHOXY TRIGLYCOL
DOWANOL 33B	=	PROPYLENE GLYCOL METHYL ETHER
DOWFUME 40, W-10, W-15, W-40	=	ETHYLENE DIBROMIDE
DOWICIDE 2	=	TRICHLOROPHENOL

SYNONYM		COMPOUND NAME
DOWICIDE 7	=	PENTACHLOROPHENOL
DOWTHERM	=	DOWTHERM
DOWTHERM E	=	O-DICHLOROBENZENE
DRACYCLIC ACID	=	BENZOIC ACID
DRYCLEANERS NAPHTHA	=	NAPHTHA STODDARD SOLVENT
DRYING OIL EPOXIDES	=	EPOXIDIZED VEGETABLE OILS
DSMA	=	METHANEARSONIC ACID, SODIUM SALTS
DUST-LAYING OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
DUTCH LIQUID	=	ETHYLENE DICHLORIDE
DYTOL S-91	=	N-DECYL ALCOHOL
E 3314	=	HEPTACHLOR
EAA	=	ETHYL ACETOACETATE
EADC	=	ETHYLALUMINUM DICHLORIDE
EASC	=	ETHYLALUMINUM SESQUICHLORIDE
EB	=	ETHYLBENZENE
EBDC,SODIUM SALT	=	NABAM
EDC	=	ETHYLENE DICHLORIDE
EDIBLE TALLOW	=	TALLOW
EDTA	=	ETHYLENEDIAMINE TETRACETIC ACID
EKTASOLVE DB ACETATE	=	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
ELECTRICAL INSULATING OIL	=	OIL: TRANSFORMER
EMBAFUME	=	METHYL BROMIDE
ENANTHIC ALCOHOL	=	HEPTANOL
ENDRATE	=	ETHYLENEDIAMINE TETRACETIC ACID
ENDRIN	=	ENDRIN
EPICHLOROHYDRIN	=	EPICHLOROHYDRIN
EPOXIDIZED DRYING OILS	=	EPOXIDIZED VEGETABLE OILS
EPOXIDIZED OILS	=	EPOXIDIZED VEGETABLE OILS
EPOXIDIZED TALL OIL, OCTYL ESTER	=	OCTYL EPOXY TALLATE
EPOXIDIZED VEGETABLE OILS	=	EPOXIDIZED VEGETABLE OILS
1,2-EPOXYBUTANE	=	BUTYLENE OXIDE
1,2-EPOXYETHANE	=	ETHYLENE OXIDE
1,2-EPOXYPROPANE	=	PROPYLENE OXIDE
ERINITRIT	=	SODIUM NITRITE
ERIOCHALCITE (ANHYDROUS)	=	COPPER CHLORIDE
ESKIMON 11	=	TRICHLOROFLUOROMETHANE
ESKIMON 12	=	DICHLORODIFLUOROMETHANE
ESKIMON 22	=	MONOCHLORODIFLUOROMETHANE
ESSENCE OF MIRBANE	=	NITROBENZENE
ETHANAL	=	ACETALDEHYDE
ETHANE	=	ETHANE
ETHANECARBOXYLIC ACID	=	PROPIONIC ACID
ETHANEDIAL	=	GLYOXAL, 40% SOLUTION
1,2-ETHANEDIAMINE	=	ETHYLENEDIAMINE
ETHANEDINITRILE	=	CYANOGEN
ETHANEDIOIC ACID	=	OXALIC ACID
ETHANEDIOIC ACID,DISODIUM SALT	=	SODIUM OXALATE
1,2-ETHANEDIOL	=	ETHYLENE GLYCOL
ETHANENITRILE	=	ACETONITRILE
ETHANETHIOL	=	ETHYL MERCAPTAN
ETHANOIC ACID	=	ACETIC ACID
ETHANOIC ANHYDRIDE	=	ACETIC ANHYDRIDE
ETHANOL	=	ETHYL ALCOHOL
ETHANOLAMINE	=	MONOETHANOLAMINE
ETHENE	=	ETHYLENE
ETHER	=	ETHYL ETHER
ETHINE	=	ACETYLENE
ETHOXYDIHYDROPYRAN	=	ETHOXYDIHYDROPYRAN
2-ETHOXY-3,4-DIHYDRO-2H-PYRAN	=	ETHOXYDIHYDROPYRAN
ETHOXYETHANE	=	ETHYL ETHER
2-ETHOXYETHANOL	=	ETHYLENE GLYCOL MONOETHYL ETHER
2-ETHOXYETHANOL, ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE

SYNONYM		COMPOUND NAME
2-(2-ETHOXYETHOXY)ETHANOL	=	DIETHYLENE GLYCOL MONOETHYL ETHER
2-ETHOXYETHYL ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
ETHOXY DIGLYCOL	=	DIETHYLENE GLYCOL MONOETHYL ETHER
ETHOXYLATED DODECANOL	=	ETHOXYLATED DODECANOL
ETHOXYLATED DODECYL ALCOHOL	=	ETHOXYLATED DODECANOL
ETHOXYLATED LAURYL ALCOHOL	=	ETHOXYLATED DODECANOL
ETHOXYLATED MYRISTYL ALCOHOL	=	ETHOXYLATED TETRADECANOL
ETHOXYLATED NONYLPHENOL	=	ETHOXYLATED NONYLPHENOL
ETHOXYLATED PENTADECANOL	=	ETHOXYLATED PENTADECANOL
ETHOXYLATED PENTADECYL ALCOHOL	=	ETHOXYLATED PENTADECANOL
ETHOXYLATED TETRADECANOL	=	ETHOXYLATED TETRADECANOL
ETHOXYLATED TETRADECYL ALCOHOL	=	ETHOXYLATED TETRADECANOL
ETHOXYLATED TRIDECANOL	=	ETHOXYLATED TRIDECANOL
ETHOXYLATED TRIDECYL ALCOHOL	=	ETHOXYLATED TRIDECANOL
ETHOXYTRIETHYLENE GLYCOL	=	ETHOXY TRIGLYCOL
ETHOXY TRIGLYCOL	=	ETHOXY TRIGLYCOL
ETHYL ACETATE	=	ETHYL ACETATE
ETHYLACETIC ACID	=	N-BUTYRIC ACID
ETHYL ACETOACETATE	=	ETHYL ACETOACETATE
ETHYL ACRYLATE	=	ETHYL ACRYLATE
ETHYL ALCOHOL	=	ETHYL ALCOHOL
ETHYL ALDEHYDE	=	ACETALDEHYDE
ETHYLALUMINUM DICHLORIDE	=	ETHYLALUMINUM DICHLORIDE
ETHYLALUMINUM SESQUICHLORIDE	=	ETHYLALUMINUM SESQUICHLORIDE
ETHYLAMINE	=	ETHYLAMINE
ETHYLBENZENE	=	ETHYLBENZENE
ETHYL BUTANOATE	=	ETHYL BUTYRATE
ETHYL BUTANOL	=	ETHYL BUTANOL
2-ETHYL-1-BUTANOL	=	ETHYL BUTANOL
2-ETHYLBUTYL ALCOHOL	=	ETHYL BUTANOL
ETHYL BUTYRATE	=	ETHYL BUTYRATE
2-ETHYLCAPROALDEHYDE	=	ETHYLHEXALDEHYDE
ETHYLCARBINOL	=	N-PROPYL ALCOHOL
ETHYL CARBONATE	=	DIETHYL CARBONATE
ETHYL CHLOROACETATE	=	ETHYL CHLOROACETATE
ETHYL CHLORIDE	=	ETHYL CHLORIDE
ETHYL CHLOROACETATE	=	ETHYL CHLOROACETATE
ETHYL CHLOROCARBONATE	=	ETHYL CHLOROFORMATE
ETHYL CHLOROETHANOATE	=	ETHYL CHLOROACETATE
ETHYL CHLOROFORMATE	=	ETHYL CHLOROFORMATE
ETHYL DICHLOROPHOSPHATE	=	ETHYL PHOSPHORODICHLORIDATE
ETHYLDICHLOROSILANE	=	ETHYLDICHLOROSILANE
ETHYLENE	=	ETHYLENE
ETHYLENE ACETATE	=	ETHYLENE GLYCOL DIACETATE
ETHYLENEBIS (DITHIOCARBAMIC ACID),DISODIUM SALT	=	NABAM
ETHYLENE BROMIDE	=	ETHYLENE DIBROMIDE
ETHYLENE CHLORHYDRIN	=	ETHYLENE CHLOROHYDRIN
ETHYLENE CHLORIDE	=	ETHYLENE DICHLORIDE
ETHYLENE CHLOROHYDRIN	=	ETHYLENE CHLOROHYDRIN
ETHYLENE CYANOHYDRIN	=	ETHYLENE CYANOHYDRIN
ETHYLENE DIACETATE	=	ETHYLENE GLYCOL DIACETATE
ETHYLENEDIAMINE	=	ETHYLENEDIAMINE
ETHYLENEDIAMINE TETRACETIC ACID	=	ETHYLENEDIAMINE TETRACETIC ACID
ETHYLENE DIBROMIDE	=	ETHYLENE DIBROMIDE
CIS-1,2-ETHYLENEDICARBOXYLIC ACID	=	MALEIC ACID
TRANS-1,2-ETHYLENEDICARBOXYLIC ACID	=	FUMARIC ACID
ETHYLENE DICHLORIDE	=	ETHYLENE DICHLORIDE
ETHYLENE DIGLYCOL	=	DIETHYLENE GLYCOL
ETHYLENE DIHYDRATE	=	ETHYLENE GLYCOL
(ETHYLENEDINITRILO)TETRAACETIC ACID	=	ETHYLENEDIAMINE TETRACETIC ACID
2,2 -ETHYLENEDIOXYDIETHANOL	=	TRIETHYLENE GLYCOL
ETHYLENE GLYCOL	=	ETHYLENE GLYCOL
ETHYLENE GLYCOL DIACETATE	=	ETHYLENE GLYCOL DIACETATE

SYNONYM		COMPOUND NAME
ETHYLENE GLYCOL DIETHYL ETHER	=	ETHYLENE GLYCOL DIETHYL ETHER
ETHYLENE GLYCOL DIHYDROXYDIETHYL ETHER	=	TRIETHYLENE GLYCOL
ETHYLENE GLYCOL DIMETHYL ETHER	=	ETHYLENE GLYCOL DIMETHYL ETHER
ETHYLENE GLYCOL ETHYL ETHER	=	ETHYLENE GLYCOL MONOETHYL ETHER
ETHYLENE GLYCOL MONOBUTYL ETHER	=	ETHYLENE GLYCOL MONOBUTYL ETHER
ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	=	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
ETHYLENE GLYCOL MONOETHYL ETHER	=	ETHYLENE GLYCOL MONOETHYL ETHER
ETHYLENE GLYCOL MONOETHYL ETHER ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
ETHYLENE GLYCOL MONOMETHYL ETHER	=	ETHYLENE GLYCOL MONOMETHYL ETHER
ETHYLENEIMINE	=	ETHYLENEIMINE
ETHYLENEDIS(IMINODIACETIC ACID)	=	ETHYLENEDIAMINE TETRACETIC ACID
ETHYLENE OXIDE	=	ETHYLENE OXIDE
ETHYL ETHANOATE	=	ETHYL ACETATE
ETHYL ETHER	=	ETHYL ETHER
ETHYL FORMATE	=	ETHYL FORMATE
ETHYL FORMIC ESTER	=	ETHYL FORMATE
ETHYLHEXALDEHYDE	=	ETHYLHEXALDEHYDE
2-ETHYLHEXALDEHYDE	=	ETHYLHEXALDEHYDE
2-ETHYLHEXANAL	=	ETHYLHEXALDEHYDE
2-ETHYL HEXANOL	=	2-ETHYL HEXANOL
2-ETHYL-1-HEXANOL	=	2-ETHYL HEXANOL
2-ETHYL-2-HEXENAL	=	2-ETHYL-3-PROPYLACROLEIN
2-ETHYLHEXYL ACRYLATE,INHIBITED	=	2-ETHYLHEXYL ACRYLATE,INHIBITED
2-ETHYLHEXYL ALCOHOL	=	2-ETHYL HEXANOL
2-ETHYLHEXYL 2-PROPENOATE	=	2-ETHYLHEXYL ACRYLATE,INHIBITED
ETHYL HEXYL TALLATE	=	ETHYL HEXYL TALLATE
2-ETHYLHEXYL TRICHLOROPHENOXYACETATE	=	2,4,5-T(ESTERS)
ETHYL 2-HYDROXYPROPANOATE	=	ETHYL LACTATE
ETHYL ALPHA-HYDROXY-PROPIONATE	=	ETHYL LACTATE
5-ETHYLIDENEBICYCLO(2.2.1)HEPT-2-ENE	=	ETHYLIDENENORBORNENE
ETHYLIDENE DIFLUORIDE	=	1,1-DIFLUOROETHANE
ETHYLIDENE FLUORIDE	=	1,1-DIFLUOROETHANE
ETHYLIDENENORBORNENE	=	ETHYLIDENENORBORNENE
ETHYLIDENENORBORNYLENE	=	ETHYLIDENENORBORNENE
ETHYLIDENENORCAMPHENE	=	ETHYLIDENENORBORNENE
ETHYL DL-LACTATE	=	ETHYL LACTATE
ETHYL LACTATE	=	ETHYL LACTATE
ETHYL MERCAPTAN	=	ETHYL MERCAPTAN
ETHYL METHACRYLATE	=	ETHYL METHACRYLATE
ETHYL 2-METHACRYLATE	=	ETHYL METHACRYLATE
ETHYL METHACRYLATE INHIBITED	=	ETHYL METHACRYLATE
ETHYL METHANOATE	=	ETHYL FORMATE
ETHYL METHYL KETONE	=	METHYL ETHYL KETONE
ETHYL ALPHAMETHYLMETHACRYLATE	=	ETHYL METHACRYLATE
ETHYL 2-METHYL-2-PROPENOATE	=	ETHYL METHACRYLATE
5-ETHYL-2-METHYLPYRIDINE	=	METHYLETHYLPYRIDINE
ETHYL NITRILE	=	ACETONITRILE
ETHYL NITRITE	=	ETHYL NITRITE
ETHYL ORTHOSILICATE	=	ETHYL SILICATE
ETHYL OXIDE	=	ETHYL ETHER
ETHYL 3-OXOBUTANOATE	=	ETHYL ACETOACETATE
ETHYL PARATHION	=	PARATHION, LIQUID
ETHYL PHENYLDICHLOROSILANE	=	ETHYL PHENYLDICHLOROSILANE
ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS	=	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
ETHYL PHOSPHORODICHLORIDO-THIONATE	=	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
ETHYL PHOSPHORODICHLORIDATE	=	ETHYL PHOSPHORODICHLORIDATE
ETHYL PHTHALATE	=	DIETHYL PHTHALATE
5-ETHYL-2-PICOLINE	=	METHYLETHYLPYRIDINE
ETHYL 2-PROPENOATE	=	ETHYL ACRYLATE
2-ETHYL-3-PROPYLACROLEIN	=	2-ETHYL-3-PROPYLACROLEIN
2-ETHYL-3-PROPYLACRYLALDEHYDE	=	2-ETHYL-3-PROPYLACROLEIN

SYNONYM		COMPOUND NAME
ETHYL PYROPHOSPHATE	=	TETRAETHYL PYROPHOSPHATE
ETHYL SILICATE	=	ETHYL SILICATE
ETHYL SILICATE CONDENSED	=	ETHYL SILICATE
ETHYL SILICATE 40	=	ETHYL SILICATE
ETHYL SILICON TRICHLORIDE	=	ETHYLTRICHLOROSILANE
ETHYL SILICONE TRICHLORIDE	=	ETHYLTRICHLOROSILANE
ETHYL SULFHYDRATE	=	ETHYL MERCAPTAN
ETHYL T..IONOPHOSPHONYL DICHLORIDE	=	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
ETHYLTRICHLOROSILANE	=	ETHYLTRICHLOROSILANE
ETHYL ZINC	=	DIETHYLZINC
ETHYNE	=	ACETYLENE
EUFIN	=	DIETHYL CARBONATE
EUNATROL	=	OLEIC ACID, SODIUM SALT
EXITELITE	=	ANTIMONY TRIOXIDE
F-11	=	TRICHLOROFLUOROMETHANE
F-12	=	DICHLORODIFLUOROETHANE
F-22	=	MONOCHLORODIFLUOROMETHANE
FAST RED GG BASE	=	4-NITROANILINE
FAST RED TR BASE	=	4-CHLORO-O-TOLUIDINE
FAST RED 2G BASE	=	4-NITROANILINE
FERMENTATION ALCOHOL	=	ETHYL ALCOHOL
FERMENTATION AMYL ALCOHOL	=	ISOAMYL ALCOHOL
FERMENTATION BUTYL ALCOHOL	=	ISOBUTYL ALCOHOL
FERRIC AMMONIUM CITRATE	=	FERRIC AMMONIUM CITRATE
FERRIC AMMONIUM CITRATE, BROWN	=	FERRIC AMMONIUM CITRATE
FERRIC AMMONIUM CITRATE, GREEN	=	FERRIC AMMONIUM CITRATE
FERRIC AMMONIUM OXALATE	=	FERRIC AMMONIUM OXALATE
FERRIC CHLORIDE	=	FERRIC CHLORIDE
FERRIC CHLORIDE, ANHYDROUS	=	FERRIC CHLORIDE
FERRIC CHLORIDE, HEXAHYDRATE	=	FERRIC CHLORIDE
FERRIC GLYCEROPHOSPHATE	=	FERRIC GLYCEROPHOSPHATE
FERRIC NITRATE	=	FERRIC NITRATE
FERRIC NITRATE NONAHYDRATE	=	FERRIC NITRATE
FERRIC SULFATE	=	FERRIC SULFATE
FERROUS AMMONIUM SULFATE	=	FERROUS AMMONIUM SULFATE
FERROUS AMMONIUM SULFATE HEXAHYDRATE	=	FERROUS AMMONIUM SULFATE
FERROUS BOROFLUORIDE	=	FERROUS FLUOROBORATE
FERROUS CHLORIDE	=	FERROUS CHLORIDE
FERROUS CHLORIDE TETRAHYDRATE	=	FERROUS CHLORIDE
FERROUS FLUOROBORATE	=	FERROUS FLUOROBORATE
FERROUS OXALATE	=	FERROUS OXALATE
FERROUS OXALATE DIHYDRATE	=	FERROUS OXALATE
FERROUS SULFATE	=	FERROUS SULFATE
FERROX	=	FERROUS OXALATE
FERTILIZER ACID	=	SULFURIC ACID
FILMERINE	=	SODIUM NITRITE
FISH OIL	=	OIL: FISH
FLAXSEED OIL	=	OILS MISCELLANEOUS: LINSEED
FLOWERS OF ANTIMONY	=	ANTIMONY TRIOXIDE
FLUORINE	=	FLUORINE
FLUOROETHYLENE	=	VINYL FLUORIDE, INHIBITED
FLUOROSILICIC ACID	=	FLUOSILICIC ACID
FLUOROSULFONIC ACID	=	FLUOSULFONIC ACID
FLUOROSULFURIC ACID	=	FLUOSULFONIC ACID
FLUORSPAR	=	CALCIUM FLUORIDE
FLUOSILICIC ACID	=	FLUOSILICIC ACID
FLUOSPAR	=	CALCIUM FLUORIDE
FLUOSULFONIC ACID	=	FLUOSULFONIC ACID
FLUX	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
FLUXING OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
FLUX OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
FOLIAGE OIL	=	OIL: SPRAY
FORMALDEHYDE DIMETHYLACETAL	=	METHYL FORMAL
FORMALDEHYDE POLYMER	=	PARAFORMALDEHYDE

SYNONYM	COMPOUND NAME
FORMALDEHYDE SOLUTION	FORMALDEHYDE SOLUTION
FORMALIN	FORMALDEHYDE SOLUTION
FORMALITH	FORMALDEHYDE SOLUTION
FORMIC ACID	FORMIC ACID
FORMIC ACID, AMMONIUM SALT	AMMONIUM FORMATE
FORMIC ACID, ETHYL ESTER	ETHYL FORMATE
FORMIC ACID, METHYL ESTER	METHYL FORMATE
FORMIC ALDEHYDE	FORMALDEHYDE SOLUTION
FORMIC ETHER	ETHYL FORMATE
FORMIN	HEXAMETHYLENETETRAMINE
FORMYLIC ACID	FORMIC ACID
FREON 11	TRICHLOROFLUOROMETHANE
FREON 12	DICHLORODIFLUOROMETHANE
FREON 22	MONOCHLORODIFLUOROMETHANE
FRIGEN 11	TRICHLOROFLUOROMETHANE
FRIGEN 12	DICHLORODIFLUOROMETHANE
NO. 1 FUEL OIL	KEROSENE
NO.1 FUEL OIL	OIL: RANGE
FUEL OIL NO. 1	JET FUEL: JP-1(KEROSENE)
FUEL OIL 1-D	OIL: DIESEL
FUEL OIL: 1-D	FUEL OIL: 1-D
FUEL OIL NO. 2	FUEL OIL: 2
FUEL OIL: NO 1(KEROSENE)	FUEL OIL: NO 1(KEROSENE)
FUEL OIL: 2	FUEL OIL: 2
FUEL OIL 2-D	OIL: DIESEL
FUEL OIL: 2-D	FUEL OIL: 2-D
FUEL OIL: 4	FUEL OIL: 4
FUEL OIL NO. 4	FUEL OIL: 4
FUEL OIL NO. 5	FUEL OIL: 5
FUEL OIL: 5	FUEL OIL: 5
FUEL OIL NO. 6	FUEL OIL: 6
FUEL OIL: 6	FUEL OIL: 6
FUMARIC ACID	FUMARIC ACID
FUMIGRAIN	ACRYLONITRILE
FUMING LIQUID ARSENIC	ARSENIC TRICHLORIDE
FUMING SULFURIC ACID	OLEUM
FURAL	FURFURAL
2-FURALDEHYDE	FURFURAL
2-FURANCARBINOL	FURFURYL ALCOHOL
2,5-FURANEDIONE	MALEIC ANHYDRIDE
FURFURAL	FURFURAL
FURFURALCOHOL	FURFURYL ALCOHOL
FURFURALDEHYDE	FURFURAL
FURFUROLE	FURFURAL
FURFURYL ALCOHOL	FURFURYL ALCOHOL
2-FURYLCARBINOL	FURFURYL ALCOHOL
ALPHA-FURYLCARBINOL	FURFURYL ALCOHOL
FUSEL OIL	ISOAMYL ALCOHOL
FYDE	FORMALDEHYDE SOLUTION
GALLIC ACID	GALLIC ACID
GALLIC ACID MONOHYDRATE	GALLIC ACID
GALLOTANNIC ACID	TANNIC ACID
GALLOTANNIN	TANNIC ACID
GAMMEXANE	BENZENE HEXACHLORIDE
GAS OIL: CRACKED	GAS OIL: CRACKED
GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)	GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)
GASOLINE, AVIATION (LESS THAN 4.86 G LEAD/GAL)	GASOLINE, AVIATION (LESS THAN 4.86 G LEAD/GAL)
GASOLINE BLENDING STOCKS: ALKYLATES	GASOLINE BLENDING STOCKS: ALKYLATES
GASOLINE BLENDING STOCKS: REFORMATES	GASOLINE BLENDING STOCKS: REFORMATES
GASOLINE: CASINGHEAD	GASOLINE: CASINGHEAD
GASOLINE: POLYMER	GASOLINE: POLYMER
GASOLINE: STRAIGHT RUN	GASOLINE: STRAIGHT RUN
GELBIN YELLOW ULTRAMARINE	CALCIUM CHROMATE

SYNONYM		COMPOUND NAME
GENETRON 11	=	TRICHLOROFLUOROMETHANE
GENETRON 12	=	DICHLORODIFLUOROMETHANE
GENETRON 22	=	MONOCHLORODIFLUOROMETHANE
GERHARDITE	=	COPPER NITRATE
GEXANE	=	BENZENE HEXACHLORIDE
GLACIAL ACETIC ACID	=	ACETIC ACID
D-GLUCITOL	=	SORBITOL
GLUCOSE SOLUTION	=	DEXTROSE SOLUTION
GLUTARALDEHYDE SOLUTION	=	GLUTARALDEHYDE SOLUTION
GLYCERINE	=	GLYCERINE
GLYCERITE	=	TANNIC ACID
GLYCEROL	=	GLYCERINE
GLYCIDYL METHACRYLATE	=	GLYCIDYL METHACRYLATE
GLYCIDYL ALPHA-METHYL ACRYLATE	=	GLYCIDYL METHACRYLATE
GLYCOL	=	ETHYLENE GLYCOL
GLYCOL BUTYL ETHER	=	ETHYLENE GLYCOL MONOBUTYL ETHER
GLYCOL CHLOROHYDRIN	=	ETHYLENE CHLORCHYDRIN
GLYCOL CYANOHYDRIN	=	ETHYLENE CYANOHYDRIN
GLYCOL DIACETATE	=	ETHYLENE GLYCOL DIACETATE
GLYCOL DIBROMIDE	=	ETHYLENE DIBROMIDE
GLYCOL DICHLORIDE	=	ETHYLENE DICHLORIDE
GLYCOL ETHYL ETHER	=	ETHYLENE
GLYCOL MONOBUTYL ETHER ACETATE	=	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
GLYCOL MONOETHYL ETHER	=	ETHYLENE GLYCOL MONOETHYL ETHER
GLYCOL MONOMETHYL ETHER	=	ETHYLENE GLYCOL MONOMETHYL ETHER
GLYCOL MONOETHYL ETHER ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
GLYOXAL, 40% SOLUTION	=	GLYOXAL, 40% SOLUTION
GRAIN ALCOHOL	=	ETHYL ALCOHOL
GRAPE SUGAR SOLUTION	=	DEXTROSE SOLUTION
GREEN OIL	=	ANTHRACENE
GREEN VITRIOL	=	FERROUS SULFATE
GREMALCENE	=	TRICHLOROETHYLENE
GUM TURPENTINE	=	TURPENTINE
GUSATHION INSECTICIDE	=	AZINPHOSMETHYL
GUTHION INSECTICIDE	=	AZINPHOSMETHYL
HALOGENATED WAXES	=	POLYCHLORINATED BIPHENYL (PCB)
HALON 122	=	DICHLORODIFLUOROMETHANE
HARTSHORN	=	AMMONIUM CARBONATE
HCH	=	BENZENE HEXACHLORIDE
HENDECANOIC ALCOHOL	=	UNDECANOL
1-HENDECANOL	=	UNDECANOL
N-HENDECYCLENIC ALCOHOL	=	UNDECANOL
HEOD	=	DIELDRIN
HEPTACHLOR	=	HEPTACHLOR
1,4,5,6,7,8,8A-HEPTACHLORODICYCLOPENTADIENE	=	HEPTACHLOR
1,4,5,6,7,8,8-HEPTACHLORO-3A,4,7,7A-TETRAHYDRO-4,7-METHANOINDENE	=	HEPTACHLOR
1-HEPTADECANECARBOXYLIC ACID	=	STEARIC ACID
CIS-8-HEPTADECYLENE-CARBOXYLIC ACID	=	OLEIC ACID
HEPTANE	=	HEPTANE
N-HEPTANE	=	HEPTANE
HEPTANOL	=	HEPTANOL
1-HEPTANOL	=	HEPTANOL
2-HEPTANONE	=	N-AMYL METHYL KETONE
1-HEPTENE	=	1-HEPTENE
HEPTYL ALCOHOL	=	HEPTANOL
HEPTYLCARBINOL	=	OCTANOL
HEPTYLENE	=	1-HEPTENE
N-HEPTYLETHYLENE	=	1-NONENE
HERCOFLEX 260	=	DICCTYL PHTHALATE
HEXA	=	HEXAMETHYLENETETRAMINE

SYNONYM		COMPOUND NAME
1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE	=	BENZENE HEXACHLORIDE
HEXACHLORCCYCLOPENTADIENE	=	HEXACHLORCCYCLOPENTADIENE
ENDO, EXO-1,2,3,4,10,10-HEXACHLORO-6,7-EPOXY-1,4,4A,5,6,7,8,8A-OCTAHYDRO-1,4:5,8-DIMETHANONAPTHALENE	=	DIELDRIN
1,2,3,4,10,10-HEXACHLORO-6,7-EPOXY-1,4,4A,5,6,7,8,8A-OCTAHYDRO-ENDO,ENDO-1	=	ENDRIN
ENDO, EXO-1,2,3,4,10-HEXACHLORO-1,4,4A,5,8,8A-HEXAHYDRO-1,4:5,8-DIMETHANONAPHTHALENE	=	ALDRIN
HEXADECYL SULFATE, SODIUM SALT	=	HEXADECYL SULFATE, SODIUM SALT
HEXADECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
HEXADECYLTRIMETHYLAMMONIUM CHLORIDE	=	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE
HEXADRIN	=	ENDRIN
HEXAFLUOSILICIC ACID	=	FLUOSILICIC ACID
HEXAHYDRIC ALCOHOL	=	SORBITOL
HEXAHYDROANILINE	=	CYCLOHEXYLAMINE
HEXAHYDRO-2H-AZEPIN-2-ONE	=	CAPROLACTAM, LIQUID
HEXAHYDROAZEPINE	=	HEXAMETHYLENEIMINE
HEXAHYDROBENZENE	=	CYCLOHEXANE
HEXAHYDRO-1,4-DIAZINE	=	PIPERAZINE
HEXAHYDROPHENOL	=	CYCLOHEXANOL
HEXAHYDROPYRAZINE	=	PIPERAZINE
N-HEXALDEHYDE	=	N-HEXALDEHYDE
HEXALIN	=	CYCLOHEXANOL
HEXAMETHYLENE	=	CYCLOHEXANE
HEXAMETHYLENEAMINE	=	HEXAMETHYLENETETRAMINE
HEXAMETHYLENEDIAMINE	=	HEXAMETHYLENEDIAMINE
HEXAMETHYLENEIMINE	=	HEXAMETHYLENEIMINE
HEXAMETHYLENETETRAMINE	=	HEXAMETHYLENETETRAMINE
HEXAMINE	=	HEXAMETHYLENETETRAMINE
HEXANAL	=	N-HEXALDEHYDE
HEXANAPHTHENE	=	CYCLOHEXANE
HEXANE	=	HEXANE
1,6-HEXANEDIAMINE	=	HEXAMETHYLENEDIAMINE
HEXANEDIOIC ACID	=	ADIPIC ACID
1,2,3,4,5,6-HEXANEHEXOL	=	SORBITOL
HEXANOL	=	HEXANOL
1-HEXANOL	=	HEXANOL
2-HEXANONE	=	METHYL N-BUTYL KETONE
ALPHA-HEXENE	=	1-HEXENE
1-HEXENE	=	1-HEXENE
HEXONE	=	METHYL ISOBUTYL KETONE
HEXYL ACETATE	=	METHYL AMYL ACETATE
HEXYL ALCOHOL	=	HEXANOL
SEC-HEXYL ALCOHOL	=	ETHYL BUTANOL
HEXYLENE GLYCOL	=	HEXYLENE GLYCOL
HGI	=	BENZENE HEXACHLORIDE
HHDN	=	ALDRIN
HI-DRY	=	TETRAETHYLENE GLYCOL
HIGH-SPEED BEARING OIL	=	OIL: SPINDLE
HIGHER FATTY ALCOHOL	=	TALLOW FATTY ALCOHOL
HMDA	=	HEXAMETHYLENEDIAMINE
HOME HEATING OIL	=	FUEL OIL: 2
HOMOPIPERIDINE	=	HEXAMETHYLENEIMINE
HOUSEHOLD AMMONIA	=	AMMONIUM HYDROXIDE
HTH	=	CALCIUM HYPOCHLORITE
HTH DRY CHLORINE	=	CALCIUM HYPOCHLORITE
HYDRACRYLIC ACID,BETA-LACTONE	=	BETA-PROPIOLACTONE

SYNONYM		COMPOUND NAME
HYDRACRYLONITRILE	=	ETHYLENE CYANOHYDRIN
HYDRAZINE	=	HYDRAZINE
HYDRAZOIC ACID,SODIUM SALT	=	SODIUM AZIDE
HYDROBROMIC ACID, ANHYDROUS	=	HYDROGEN BROMIDE
HYDROCHLORIC ACID	=	HYDROCHLORIC ACID
HYDROCHLORIC ACID, ANHYDROUS	=	HYDROGEN CHLORIDE
HYDROCYANIC ACID	=	HYDROGEN CYANIDE
HYDROCYANIC ACID, SODIUM SALT	=	SODIUM CYANIDE
HYDROFLUORIC ACID	=	HYDROFLUORIC ACID
HYDROFLUORIC ACID, ANHYDROUS	=	HYDROGEN FLUORIDE
HYDROFLUOSILICIC ACID	=	FLUOSILICIC ACID
HYDROGEN BROMIDE	=	HYDROGEN BROMIDE
HYDROGEN BROMIDE, ANHYDROUS	=	HYDROGEN BROMIDE
HYDROGEN CHLORIDE	=	HYDROGEN CHLORIDE
HYDROGEN CYANIDE	=	HYDROGEN CYANIDE
HYDROGEN FLUORIDE	=	HYDROGEN FLUORIDE
HYDROGEN HEXAFLUOROSILICATE	=	FLUOSILICIC ACID
HYDROGEN PEROXIDE	=	HYDROGEN PEROXIDE
HYDROGEN PEROXIDE CARBAMIDE	=	UREA PEROXIDE
HYDROGEN SULFIDE	=	HYDROGEN SULFIDE
HYDROGEN, LIQUEFIED	=	HYDROGEN, LIQUEFIED
HYDROPEROXYCYCLOHEXYL HYDROXYCYCLOHEXYL PEROXIDE	=	CYCLOHEXANONE PEROXIDE
1-HYDROPEROXYCYCLOHEXYL 1-HYDROXYCYCLOHEXYL PEROXIDE	=	CYCLOHEXANONE PEROXIDE
HYDROQUINOL	=	HYDROQUINONE
HYDROQUINONE	=	HYDROQUINONE
HYDROXY ETHER	=	ETHYLENE GLYCOL MONOETHYL ETHER
HYDROXYBENZENE	=	PHENOL
P-HYDROXYBENZENSULFONIC ACID,ZINC SALT	=	ZINC PHENOLSULFONATE
O-HYDROXYBENZOIC ACID	=	SALICYLIC ACID
1-HYDROXYBUTANE	=	N-BUTYL ALCOHOL
2-HYDROXYBUTANE	=	SEC-BUTYL ALCOHOL
1-HYDROXY-2-CYANOETHANE	=	ETHYLENE CYANOHYDRIN
HYDROXYCYCLOHEXANE	=	CYCLOHEXANOL
HYDROXYDIMETHYLARSINE OXIDE	=	CACODYLIC ACID
1-HYDROXY-2,4-DINITROBENZENE	=	2,4-DINITROPHENOL
BETA-HYDROXYETHYL ACRYLATE	=	2-HYDROXYETHYL ACRYLATE, INHIBITED
2-HYDROXYETHYL ACRYLATE, INHIBITED	=	2-HYDROXYETHYL ACRYLATE, INHIBITED
2-HYDROXYETHYLAMINE	=	MONOETHANOLAMINE
N-HYDROXYETHYL-1,2-ETHANEDIAMINE	=	AMINOETHYLETHANOLAMINE
N-BETA HYDROXYETHYLETHYLENEDIAMINE	=	AMINOETHYLETHANOLAMINE
2-HYDROXYETHYL 2-PROPENOATE	=	2-HYDROXYETHYL ACRYLATE, INHIBITED
1-HYDROXYHEPTANE	=	HEPTANOL
1-HYDROXYHEXANE	=	HEXANOL
ALPHA-HYDROXYISOBUTYRONITRILE	=	ACETONE CYANOHYDRIN
HYDROXYLAMINE SULFATE	=	HYDROXYLAMINE SULFATE
2-HYDROXYMETHYLFURAN	=	FURFURYL ALCOHOL
TETRAKIS (HYDROXYMETHYL) METHANE	=	PENTAERYTHRITOL
4-HYDROXY-4-METHYL-2-PENTANONE	=	DIACETONE ALCOHOL
4-HYDROXYNITROBENZENE	=	4-NITROPHENOL
2-HYDROXYNITROBENZENE	=	2-NITROPHENOL
2,2-BIS(P-HYDROXYPHENYL)PROPANE, DIGLYCIDYL ETHER	=	BISPHENOL A DIGLYCIDYL ETHER
3-HYDROXYPROPANENITRILE	=	ETHYLENE CYANOHYDRIN
2-HYDROXY-1,2,3-PROPANETRICARBOXYLIC ACID	=	CITRIC ACID
2-HYDROXYPROPANOIC ACID	=	LACTIC ACID
ALPHA-HYDROXYPROPIONIC ACID	=	LACTIC ACID
HYDROXYPROPYL ACRYLATE	=	HYDROXYPROPYL ACRYLATE
2-HYDROXYPROPYLAMINE	=	MONOISOPROPANOLAMINE
HYDROXYPROPYL METHACRYLATE	=	HYDROXYPROPYL METHACRYLATE
6-HYDROXY-3-(2H)-PYRIDAZINONE	=	MALEIC HYDRAZIDE
HYDROXYTOLUENES	=	CRESOLS

SYNONYM		COMPOUND NAME
ALPHA-HYDROXYTOLUENE	=	BENZYL ALCOHOL
BETA-HYDROXYTRICARBALLYLIC ACID	=	CITRIC ACID
BETA-HYDROXYTRICARBOXYLIC ACID	=	CITRIC ACID
2-HYDROXY-M-XYLENE	=	XYLENOL
HYLENE M50	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
HYLENE T	=	TOLUENE 2,4-DIISOCYANATE (TDI)
HYTROL O	=	CYCLOHEXANONE
IBN	=	ISOBUTYRONITRILE
ILLUMINATING OIL	=	KEROSENE
2,2 -IMINODIETHANOL	=	DIETHANOLAMINE
1,1 -IMINODI-2-PROPANOL	=	DIISOPROPANOLAMINE
IMPERIAL GREEN	=	COPPER ACETOARSENITE
INEDIBLE TALLOW	=	TALLOW
INSULATING OIL	=	OIL: TRANSFORMER
IRON AMMONIUM SULFATE	=	FERROUS AMMONIUM SULFATE
IRON (III) CHLORIDE	=	FERRIC CHLORIDE
IRON DICHLORIDE	=	FERROUS CHLORIDE
IRON(OUS)SULFATE	=	FERROUS SULFATE
IRON PERCHLORIDE	=	FERRIC CHLORIDE
IRON PROTOCHLORIDE	=	FERROUS CHLORIDE
IRON PROTOXALATE	=	FERROUS OXALATE
IRON SESQUISULFATE	=	FERRIC SULFATE
IRON (III) SULFATE	=	FERRIC SULFATE
IRON TERSULFATE	=	FERRIC SULFATE
IRON TRICHLORIDE	=	FERRIC CHLORIDE
IRON VITRIOL	=	FERROUS SULFATE
ISCEON 11	=	TRICHLOROFLUOROMETHANE
ISOAMYL ALCOHOL	=	ISOAMYL ALCOHOL
ISOBUTANE	=	ISOBUTANE
ISOBUTANOL	=	ISOBUTYL ALCOHOL
ISOBUTENE	=	ISOBUTYLENE
ISOBUTENYL METHYL KETONE	=	MESITYL OXIDE
ISOBUTYL ACETATE	=	ISOBUTYL ACETATE
ISOBUTYL ALCOHOL	=	ISOBUTYL ALCOHOL
ISOBUTYLALDEHYDE	=	ISO-BUTYRALDEHYDE
ISO-BUTYLAMINE	=	ISOBUTYLAMINE
ISOBUTYLAMINE	=	ISOBUTYLAMINE
ISOBUTYLCARBINOL	=	ISOAMYL ALCOHOL
ISOBUTYLENE	=	ISOBUTYLENE
ISOBUTYL METHYL CARBINOL	=	METHYL ISOBUTYL CARBINOL
ISOBUTYLMETHYL CARBINOL	=	METHYL AMYL ALCOHOL
ISOBUTYL METHYL KETONE	=	METHYL ISOBUTYL KETONE
ISOBUTYLMETHYLMETHANOL	=	METHYL AMYL ALCOHOL
ISOBUTYRALDEHYDE	=	ISO-BUTYRALDEHYDE
ISOBUTYRIC ACID	=	ISOBUTYRIC ACID
ISOBUTYRIC ALDEHYDE	=	ISO-BUTYRALDEHYDE
ISOBUTYRONITRILE	=	ISOBUTYRONITRILE
ISOCYANIC ACID, 4-METHYL-M-PHENYLENE ESTER	=	TOLUENE 2,4-DIISOCYANATE (TDI)
ISODECALDEHYDE	=	ISODECALDEHYDE
ISODECALDEHYDE, MIXED ISOMERS	=	ISODECALDEHYDE
ISO-DECYL ACRYLATE	=	ISODECYL ACRYLATE, INHIBITED
ISODECYL ACRYLATE, INHIBITED	=	ISODECYL ACRYLATE, INHIBITED
ISODECYL ALCOHOL	=	ISODECYL ALCOHOL
ISODIPRENE	=	CARENE
ISOHEXANE	=	ISOHEXANE
ISONITROPROPANE	=	2-NITROPROPANE
ISOOCTALDEHYDE	=	ISOOCTALDEHYDE
ISOOCTYL ALCOHOL	=	ISOOCTYL ALCOHOL
ISOOCTYL ALDEHYDE	=	ISOOCTALDEHYDE
ISOOCTYL TRICHLOROPHENOXYACETATE	=	2,4,5-T(ESTERS)
ISOPENTANE	=	ISOPENTANE
ISOPENTYL ALCOHOL	=	ISOAMYL ALCOHOL
ISOPENTYL NITRITE	=	ISO-AMYL NITRITE
ISOPHORONE	=	ISOPHORONE

SYNONYM		COMPOUND NAME
ISOPHTHALIC ACID	=	ISOPHTHALIC ACID
ISOPRENE	=	ISOPRENE
ISOPROPANOL	=	ISOPROPYL ALCOHOL
ISOPROPANOLAMINE	=	MONOISOPROPANOLAMINE
ISOPROPENYLBENZENE	=	ALPHA-METHYLSTYRENE
ISOPROPENYL METHYL KETONE	=	METHYL ISOPROPENYL KETONE, INHIBITED
2-ISOPROPOXYPROPANE	=	ISOPROPYL ETHER
ISOPROPYL ACETATE	=	ISOPROPYL ACETATE
ISOPROPYLACETONE	=	METHYL ISOBUTYL KETONE
ISOPROPYL ALCOHOL	=	ISOPROPYL ALCOHOL
ISO-PROPYLAMINE	=	ISOPROPYLAMINE
ISOPROPYLAMINE	=	ISOPROPYLAMINE
ISOPROPYLAMINE DODECYLBENZENESULFONATE	=	DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT
ISOPROPYLBENZENE	=	CUMENE
ISOPROPYLBENZENE HYDROPEROXIDE	=	CUMENE HYDROPEROXIDE
ISOPROPYLCARBINOL	=	ISOBUTYL ALCOHOL
ISOPROPYLCUMYL HYDROPEROXIDE	=	DIISOPROPYLBENZENE HYDROPEROXIDE
ISOPROPYL CYANIDE	=	ISOBUTYRONITRILE
ISOPROPYL 2,4-DICHLOROPHENOXY ACETATE	=	2,4-D ESTERS
ISOPROPYL ETHER	=	ISOPROPYL ETHER
ISOPROPYLFORMIC ACID	=	ISOBUTYRIC ACID
ISOPROPYLIDENEACETONE	=	MESITYL OXIDE
4,4 -ISOPROPYLIDENEDIPHENOL	=	BISPHENOL A
4,4 -ISOPROPYLIDENEDIPHENOLEPICHLOROHYDRIN RESIN	=	BISPHENOL A DIGLYCIDYL ETHER
ISOPROPYL MERCAPTAN	=	ISOPROPYL MERCAPTAN
ISOPROPYL PERCARBONATE	=	ISOPROPYL PERCARBONATE
ISOPROPYL PEROXYDICARBONATE	=	ISOPROPYL PERCARBONATE
P-ISOPROPYLTOLUENE	=	P-CYMENE
ISOPROPYLTOLUOL	=	P-CYMENE
ISOTRIDECANOL	=	TRIDECANOL
ISOTRIDECYL ALCOHOL	=	TRIDECANOL
ISOTRON 11	=	TRICHLOROFLUOROMETHANE
ISOTRON 12	=	DICHLORODIFLUOROETHANE
ISOTRON 22	=	MONOCHLORODIFLUOROMETHANE
ISOVALERAL	=	ISOVALERALDEHYDE
ISOVALERALDEHYDE	=	ISOVALERALDEHYDE
ISOVALERIC ALDEHYDE	=	ISOVALERALDEHYDE
ISOVALERONE	=	DIISOBUTYL KETONE
JP-1	=	OIL: RANGE
JP-1	=	FUEL OIL: NO 1(KEROSENE)
JP-1	=	KEROSENE
JET FUEL: JP-1(KEROSENE)	=	JET FUEL: JP-1(KEROSENE)
JET FUEL: JP-3	=	JET FUEL: JP-3
JET FUEL: JP-4	=	JET FUEL: JP-4
JET FUEL: JP-5(KEROSENE, HEAVY)	=	JET FUEL: JP-5(KEROSENE, HEAVY)
JOCUTIN	=	BENZENE HEXACHLORIDE
KEL F MONOMER	=	TRIFLUOROCHLOROETHYLENE
KELTHANE	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
KELTHANETHANOL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
KEROSENE	=	OIL: RANGE
KEROSENE	=	JET FUEL: JP-1(KEROSENE)
KEROSENE	=	FUEL OIL: NO 1(KEROSENE)
KEROSENE	=	KEROSENE
KEROSENE, HEAVY	=	JET FUEL: JP-5(KEROSENE, HEAVY)
KEROSENE, HEAVY	=	OIL: SPRAY
KEROSINE	=	KEROSENE
KEROSINE	=	OIL: RANGE
KEROSINE	=	FUEL OIL: NO 1(KEROSENE)
KEROSINE	=	JET FUEL: JP-1(KEROSENE)
2-KETOHEPTANE	=	N-AMYL METHYL KETONE

SYNONYM	COMPOUND NAME
2-KETOHEXAMETHYLENIMINE	CAPROLACTAM, LIQUID
KETTLE-RENDERED LARD	OILS EDIBLE, LARD
KILLAX	TETRAETHYL PYROPHOSPHATE
KINGS GOLD	ARSENIC TRISULFIDE
KINGS GREEN	COPPER ACETOARSENITE
KINGS YELLOW	ARSENIC TRISULFIDE
KWELL	BENZENE HEXACHLORIDE
LACTIC ACID	LACTIC ACID
DL-LACTIC ACID, AMMONIUM SALT	AMMONIUM LACTATE
LACTIC ACID, ETHYL ESTER	ETHYL LACTATE
LAH	LITHIUM ALUMINUM HYDRIDE
LATEX, LIQUID SYNTHETIC	LATEX, LIQUID SYNTHETIC
LAUGHING GAS	NITROUS OXIDE
LAUROYL PEROXIDE	LAUROYL PEROXIDE
LAURYL ALCOHOL	DODECANOL
LAURYL AMMONIUM SULFATE	AMMONIUM LAURYL SULFATE
LAURYL BENZENE	DODECYLBENZENE
LAURYL MAGNESIUM SULFATE	DODECYL SULFATE, MAGNESIUM SALT
LAURYL MERCAPTAN	LAURYL MERCAPTAN
LAURYL SODIUM SULFATE	DODECYL SULFATE, SODIUM SALT
LAURYL SULFATE, MAGNESIUM SALT	DODECYL SULFATE, MAGNESIUM SALT
LAURYL SULFATE, SODIUM SALT	DODECYL SULFATE, SODIUM SALT
LAURYL SULFATE, TRIETHANOLAMINE SALT	DODECYL SULFATE, TRIETHANOLAMINE SALT
LEAD (IV) ACETATE	LEAD TETRAACETATE
LEAD ACETATE	LEAD ACETATE
LEAD ACETATE TRIHYDRATE	LEAD ACETATE
LEAD ARSENATE	LEAD ARSENATE
LEAD ARSENATE, ACID	LEAD ARSENATE
LEAD DIFLUORIDE	LEAD FLUORIDE
LEAD FLUOBORATE	LEAD FLUOROBORATE
LEAD FLUORIDE	LEAD FLUORIDE
LEAD FLUOROBORATE	LEAD FLUOROBORATE
LEAD FLUOROBORATE SOLUTION	LEAD FLUOROBORATE
LEAD IODIDE	LEAD IODIDE
LEAD MONOXIDE	LITHARGE
LEAD NITRATE	LEAD NITRATE
LEAD OXIDE, YELLOW	LITHARGE
LEAD PROTOXIDE	LITHARGE
LEAD SULFOCYANATE	LEAD THIOCYANATE
LEAD TETRAACETATE	LEAD TETRAACETATE
LEAD TETRAETHYL	TETRAETHYL LEAD
LEAD TETRAMETHYL	TETRAMETHYL LEAD
LEAD THIOCYANATE	LEAD THIOCYANATE
LEAF LARD	OILS EDIBLE, LARD
LEUCOL	QUINOLINE
LICHENIC ACID	FUMARIC ACID
LIGHT NAPHTHA	NAPHTHA SOLVENT
LIGHT NAPHTHA	NAPTHA VM + P (75 PER CENT NAPTHA)
LIGHT OIL	OIL: COAL TAR
LIMED WOOD ROSIN	CALCIUM RESINATE
LIMONENE	DIPENTENE
LINDANE	BENZENE HEXACHLORIDE
LINEAR ALCOHOLS (12-15 CARBONS)	LINEAR ALCOHOLS (12-15 CARBONS)
LIQUEFIED NATURAL GAS (LNG)	LIQUEFIED NATURAL GAS (LNG)
LIQUEFIED PETROLEUM GAS (LPG)	LIQUEFIED PETROLEUM GAS (LPG)
LIQUID AMMONIA	AMMONIA ANHYDROUS
LIQUID ASPHALT	ASPHALT BLENDING STOCK:ROOFERS FLUX
LIQUID ASPHALT	OIL: ROAD
LIQUID BLEACH	SODIUM HYPOCHLORITE
LIQUID GUM CAMPHOR	CAMPHOR OIL
LIQUID HYDROGEN	HYDROGEN, LIQUEFIED
LIQUID IMPURE CAMPHOR	CAMPHOR OIL
LIQUID NITROGEN	NITROGEN, LIQUEFIED
LIQUID NITROGEN DIOXIDE	NITROGEN TETROXIDE
LIQUID OXYGEN	OXYGEN, LIQUEFIED

SYNONYM		COMPOUND NAME
LIQUID PETROLATUM	=	OIL: MINERAL
LIQUIFIED PHENOL	=	CARBOLIC OIL
LITHARGE	=	LITHARGE
LITHIUM ALUMINUM HYDRIDE	=	LITHIUM ALUMINUM HYDRIDE
LITHIUM HYDRIDE	=	LITHIUM HYDRIDE
LITHIUM, METALLIC	=	LITHIUM, METALLIC
LNG	=	LIQUEFIED NATURAL GAS (LNG)
LONG-TIME BURNING OIL	=	BENZENE HEXACHLORIDE
LONG-TIME BURNING OIL	=	OIL: MINERAL SEAL
LOROL-22	=	N-DECYL ALCOHOL
LOX	=	OXYGEN, LIQUEFIED
LPG	=	LIQUEFIED PETROLEUM GAS (LPG)
LUBRICATING OIL	=	OIL: MOTOR
LUCIDOL-70	=	DIBENZOYL PEROXIDE
LUMBRICAL	=	PIPERAZINE
LUNAR CAUSTIC	=	SILVER NITRATE
LUPERCO JCB-50-T	=	CYCLOHEXANONE PEROXIDE
LYE	=	CAUSTIC SODA SOLUTION
LYE	=	CAUSTIC POTASH SOLUTION
MAAC	=	METHYL AMYL ACETATE
MACQUERS SALT	=	POTASSIUM ARSENATE
M-B-C FUMIGANT	=	METHYL BROMIDE
M-DNB	=	M-DINITROBENZENE
MAGNESIUM	=	MAGNESIUM
MAGNESIUM DODECYL SULFATE	=	DODECYL SULFATE, MAGNESIUM SALT
MAGNESIUM LAURYL SULFATE	=	DODECYL SULFATE, MAGNESIUM SALT
MAGNESIUM PERCHLORATE	=	MAGNESIUM PERCHLORATE
MAGNESIUM PERCHLORATE, ANHYDROUS	=	MAGNESIUM PERCHLORATE
MAGNESIUM PERCHLORATE HEXAHYDRATE	=	MAGNESIUM PERCHLORATE
MALATHION	=	MALATHION
MALAZIDE	=	MALEIC HYDRAZIDE
MALEIC ACID	=	MALEIC ACID
MALEIC ACID HYDRAZIDE	=	MALEIC HYDRAZIDE
MALEIC ANHYDRIDE	=	MALEIC ANHYDRIDE
MALEIC HYDRAZIDE	=	MALEIC HYDRAZIDE
MALEINIC ACID	=	MALEIC ACID
MALENIC ACID	=	MALEIC ACID
MALONIC MONONITRILE	=	CYANOACETIC ACID
MAOH	=	METHYL ISOBUTYL CARBINOL
MAOH	=	METHYL AMYL ALCOHOL
MAPP GAS	=	METHYLACETYLENE - PROPADIENE MIXTURE
MARLATE 50	=	METHOXYCHLOR
MARSH GAS	=	METHANE
MARSHITE	=	COPPER IODIDE
MASSICOT	=	LITHARGE
MCB	=	CHLOROBENZENE
MCP	=	CALCIUM PHOSPHATE
MDI	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
MEADOW GREEN	=	COPPER ACETOARSENITE
ME CB	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
MEK	=	METHYL ETHYL KETONE
MENDRIN	=	ENDRIN
MEP	=	METHYLETHYLPYRIDINE
MERCAPTOETHANE	=	ETHYL MERCAPTAN
MERCAPTOMETHANE	=	METHYL MERCAPTAN
MERCAPTOSUCCINIC ACID, S-ESTER WITH O,O-DIMETHYL DITHIOPHOSPHATE	=	MALATHION
MERCURIALIN	=	METHYLAMINE
MERCURIC ACETATE	=	MERCURIC ACETATE
MERCURIC AMMONIUM CHLORIDE	=	MERCURIC AMMONIUM CHLORIDE
MERCURIC CHLORIDE	=	MERCURIC CHLORIDE
MERCURIC CHLORIDE, AMMONIATED	=	MERCURIC AMMONIUM CHLORIDE
MERCURIC CYANIDE	=	MERCURIC CYANIDE
MERCURIC IODIDE	=	MERCURIC IODIDE

SYNONYM		COMPOUND NAME
MERCURIC IODIDE, RED	=	MERCURIC IODIDE
MERCURIC NITRATE	=	MERCURIC NITRATE
MERCURIC NITRATE MONOHYDRATE	=	MERCURIC NITRATE
MERCURIC OXIDE	=	MERCURIC OXIDE
MERCURIC OXIDE, RED ((RED PRECIPITATE()	=	MERCURIC OXIDE
MERCURIC OXIDE, YELLOW ((YELLOW PRECIPITATE()	=	MERCURIC OXIDE
MERCURIC SULFIDE	=	MERCURIC SULFIDE
MERCURIC SULFIDE, BLACK (ETHIOPS MINERAL)	=	MERCURIC SULFIDE
MERCURIC SULFIDE, RED (VERMILLION, ARTIFICIAL CINNABAR, CHINESE RED)	=	MERCURIC SULFIDE
MERCUROUS CHLORIDE	=	MERCUROUS CHLORIDE
MERCUROUS NITRATE	=	MERCUROUS NITRATE
MERCUROUS NITRATE MONOHYDRATE	=	MERCUROUS NITRATE
MERCURY	=	MERCURY
MERCURY AMMONIUM CHLORIDE	=	MERCURIC AMMONIUM CHLORIDE
MERCURY BICHLORIDE	=	MERCURIC CHLORIDE
MERCURY BINIODIDE	=	MERCURIC IODIDE
MERCURY (II) CHLORIDE	=	MERCURIC CHLORIDE
MERCURY (II) CHLORIDE AMMONOBASIC	=	MERCURIC AMMONIUM CHLORIDE
MERCURY CYANIDE	=	MERCURIC CYANIDE
MERCURY (II) CYANIDE	=	MERCURIC CYANIDE
MERCURY MONOCHLORIDE	=	MERCUROUS CHLORIDE
MERCURY (II) NITRATE	=	MERCURIC NITRATE
MERCURY OXIDE	=	MERCURIC OXIDE
MERCURY PERCHLORIDE	=	MERCURIC CHLORIDE
MERCURY PERNITRATE	=	MERCURIC NITRATE
MERCURY PROTOCHLORIDE	=	MERCUROUS CHLORIDE
MERCURY PROTONITRATE	=	MERCUROUS NITRATE
MERCURY SUBCHLORIDE	=	MERCUROUS CHLORIDE
MESITYL OXIDE	=	MESITYL OXIDE
METALLIC RESINATE	=	CALCIUM RESINATE
METHACRYLATE MONOMER	=	METHYL METHACRYLATE
METHACRYLIC ACID, BUTYL ESTER	=	N-BUTYL METHACRYLATE
METHACRYLIC ACID,2,3-EPOXYPROPYL ESTER	=	GLYCIDYL METHACRYLATE
METHACRYLIC ACID, ETHYL ESTER	=	ETHYL METHACRYLATE
METHACRYLIC ACID, METHYL ESTER	=	METHYL METHACRYLATE
BETA-METHALLYL CHLORIDE	=	METHALLYL CHLORIDE
METHALLYL CHLORIDE	=	METHALLYL CHLORIDE
METHANAL	=	FORMALDEHYDE SOLUTION
METHANE	=	METHANE
METHANEARSONIC ACID, SODIUM SALTS	=	METHANEARSONIC ACID, SODIUM SALTS
2-METHOXYETHANOL	=	ETHYLENE GLYCOL MONOMETHYL ETHER
2-(2-METHOXYETHOXY)ETHANOL	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
METHOXYETHYLENE	=	VINYL METHYL ETHER, INHIBITED
1-METHOXY-2-PROPANOL	=	PROPYLENE GLYCOL METHYL ETHER
METHYLACETALDEHYDE	=	PROPIONALDEHYDE
METHYL ACETATE	=	METHYL ACETATE
METHYLACETIC ACID	=	PROPIONIC ACID
METHYLACETIC ANHYDRIDE	=	PROPIONIC ANHYDRIDE
METHANETHIOL	=	METHYL MERCAPTAN
METHANETHIOMETHANE	=	DIMETHYL SULFIDE
METHANOIC ACID	=	FORMIC ACID
METHANOL	=	METHYL ALCOHOL
METHENEAMINE	=	HEXAMETHYLENETETRAMINE
METHOXYCHLOR	=	METHOXYCHLOR
METHOXY-DDT	=	METHOXYCHLOR
METHOXYDIGLYCOL	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
METHYLACETYLENE-ALLENE MIXTURE	=	METHYLACETYLENE - PROPADIENE MIXTURE
METHYLACETYLENE - PROPADIENE MIXTURE	=	METHYLACETYLENE - PROPADIENE MIXTURE
BETA-METHYLACROLEIN	=	CROTONALDEHYDE
METHYL ACRYLATE	=	METHYL ACRYLATE

SYNONYM		COMPOUND NAME
METHYLAL	=	METHYL FORMAL
METHYL ALCOHOL	=	METHYL ALCOHOL
BETA-METHYLALLYL CHLORIDE	=	METHALLYL CHLORIDE
METHYLAMINE	=	METHYLAMINE
N-METHYLAMINOBENZENE	=	N-METHYLANILINE
METHYL AMYL ACETATE	=	METHYL AMYL ACETATE
METHYL AMYL ALCOHOL	=	METHYL AMYL ALCOHOL
METHYLAMYL ALCOHOL	=	METHYL ISOBUTYL CARBINOL
METHYL AMYL KETONE	=	N-AMYL METHYL KETONE
O-METHYLANILINE	=	O-TOLUIDINE
2-METHYLANILINE	=	O-TOLUIDINE
N-METHYLANILINE	=	N-METHYLANILINE
METHYLANILINE (MONO)	=	N-METHYLANILINE
2-METHYLAZIRIDINE	=	PROPYLENEIMINE, INHIBITED
METHYLBENZENE	=	TOLUENE
METHYLBENZENESULFONIC ACID	=	P-TOLUENESULFONIC ACID
METHYLBENZOL	=	TOLUENE
BETA-METHYLBIVINYL	=	ISOPRENE
METHYL BROMIDE	=	METHYL BROMIDE
2-METHYL-1,3-BUTADIENE	=	ISOPRENE
3-METHYLBUTANAL	=	ISOVALERALDEHYDE
2-METHYLBUTANE	=	ISOPENTANE
3-METHYL-1-BUTANOL	=	ISOAMYL ALCOHOL
2-METHYL-1-BUTENE-3-ONE	=	METHYL ISOPROPENYL KETONE, INHIBITED
METHYL N-BUTYL KETONE	=	METHYL N-BUTYL KETONE
3-METHYLBUTYL NITRITE	=	ISO-AMYL NITRITE
3-METHYLBUTYRALDEHYDE	=	ISOVALERALDEHYDE
METHYL CARBITOL	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
METHYL CELLOSOLVE	=	ETHYLENE GLYCOL MONOMETHYL ETHER
METHYL CHLORIDE	=	METHYL CHLORIDE
METHYL CHLOROCARBONATE	=	METHYL CHLOROFORMATE
METHYL CHLOROFORM	=	TRICHLOROETHANE
METHYL CHLOROFORMATE	=	METHYL CHLOROFORMATE
METHYL CHLOROMETHYL ETHER, ANHYDROUS	=	CHLOROMETHYL METHYL ETHER
METHYL CYANIDE	=	ACETONITRILE
METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL	=	METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL
METHYLCYCLOPENTANE	=	METHYLCYCLOPENTANE
METHYLDICHLOROSILANE	=	METHYLDICHLOROSILANE
1-METHYL-2,4-DINITROBENZENE	=	2,4-DINITROTOLUENE
METHYLENE CHLORIDE	=	DICHLOROMETHANE
METHYLENE DICHLORIDE	=	DICHLOROMETHANE
METHYLENE DIMETHYL ETHER	=	METHYL FORMAL
METHYLENEBIS(4-PHENYL ISOCYANATE)	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
METHYL ETHER	=	DIMETHYL ETHER
METHYL ETHER WOOD ETHER	=	DIMETHYL ETHER
METHYLETHYLCARBINOL	=	SEC-BUTYL ALCOHOL
METHYLETHYLENE	=	PROPYLENE
METHYLETHYLENE GLYCOL	=	PROPYLENE GYLCOL
2-METHYLETHYLENIMINE	=	PROPYLENEIMINE, INHIBITED
METHYL ETHYL KETONE	=	METHYL ETHYL KETONE
METHYLETHYLPYRIDINE	=	METHYLETHYLPYRIDINE
METHYL FORMAL	=	METHYL FORMAL
METHYL FORMATE	=	METHYL FORMATE
6-METHYL-1-HEPTANAL	=	ISOOCTALDEHYDE
6-METHYL-1-HEPTANOL	=	ISOOCTYL ALCOHOL
METHYLHYDRAZINE	=	METHYLHYDRAZINE
METHYL ISOBUTENYL KETONE	=	MESITYL OXIDE
METHYLISOBUTYL CARBINOL	=	METHYL AMYL ALCOHOL
METHYL ISOBUTYL CARBINOL	=	METHYL ISOBUTYL CARBINOL
METHYLISOBUTYLCARBINYL ACETATE	=	METHYL AMYL ACETATE
METHYL ISOBUTYL KETONE	=	METHYL ISOBUTYL KETONE
METHYL ISOPROPENYL KETONE, INHIBITED	=	METHYL ISOPROPENYL KETONE, INHIBITED
1-METHYL-4-ISOPROPYL-BENZENE	=	P-CYMENE

SYNONYM		COMPOUND NAME
2-METHYLLACTONITRILE	=	ACETONE CYANOHYDRIN
METHYL MERCAPTAN	=	METHYL MERCAPTAN
METHYL METHACRYLATE	=	METHYL METHACRYLATE
METHYL ALPHA-METHACRYLATE	=	METHYL METHACRYLATE
METHYLMETHANE	=	ETHANE
METHYL 2-METHYL-2-PROPENOATE	=	METHYL METHACRYLATE
METHYL OXIRANE	=	PROPYLENE OXIDE
METHYL PARATHION	=	METHYL PARATHION
2-METHYLPENTANE	=	ISOHEXANE
2-METHYL-2,4-PENTANEDIOL	=	HEXYLENE GLYCOL
4-METHYL-2-PENTANOL	=	METHYL AMYL ALCOHOL
4-METHYL-2-PENTANOL	=	METHYL ISOBUTYL CARBINOL
4-METHYL-2-PENTANOL, ACETATE	=	METHYL AMYL ACETATE
4-METHYL-2-PENTANONE	=	METHYL ISOBUTYL KETONE
4-METHYL-3-PENTENE-2-ONE	=	MESITYL OXIDE
4-METHYL-2-PENTYL ACETATE	=	METHYL AMYL ACETATE
1-METHYL-1-PHENYLETHYLENE	=	ALPHA-METHYLSTYRENE
METHYL PENTYL KETONE	=	N-AMYL METHYL KETONE
METHYLPHENOLS	=	CRESOLS
METHYLPHENYLAMINE	=	N-METHYLANILINE
METHYL PHENYL KETONE	=	ACETOPHENONE
METHYL PHOSPHONOTHIOIC DICHLORIDE(ANHYD)	=	METHYL PHOSPHONOTHIOIC DICHLORIDE(ANHYD)
2-METHYLPROPANAL	=	ISO-BUTYRALDEHYDE
2-METHYLPROPANE	=	ISOBUTANE
2-METHYLPROPANENITRILE	=	ISOBUTYRONITRILE
2-METHYLPROPANOIC ACID	=	ISOBUTYRIC ACID
2-METHYL-1-PROPANOL	=	ISOBUTYL ALCOHOL
2-METHYL-2-PROPANOL	=	TERT-BUTYL ALCOHOL
2-METHYLPROPENE	=	ISOBUTYLENE
METHYL 2-PROPENOATE	=	METHYL ACRYLATE
ALPHA-METHYLPROPIONIC ACID	=	ISOBUTYRIC ACID
2-METHYLPROPIONITRILE	=	ISOBUTYRONITRILE
2-METHYL-1-PROPYL ACETATE	=	ISOBUTYL ACETATE
METHYL PROPYL BENZENE	=	P-CYMENE
BETA-METHYLPROPYL ETHANOATE	=	ISOBUTYL ACETATE
1-METHYL-2-(3-PYRIDYL)PYRROLIDINE	=	NICOTINE
1-METHYL-2-(3-PYRIDYL) PYRROLIDINE,3-(1-METHYL-2-PYRROLIDYL) PYRIDINE	=	NICOTINE
N-METHYLPYRROLIDINONE	=	1-METHYLPYRROLIDONE
1-METHYLPYRROLIDONE	=	1-METHYLPYRROLIDONE
N-METHYL-PYRROLIDONE	=	1-METHYLPYRROLIDONE
1-METHYL-2-PYRROLIDINONE	=	1-METHYLPYRROLIDONE
N-METHYL-ALPHA-PYRROLIDONE	=	1-METHYLPYRROLIDONE
3-(2-METHYL-2-PYRROLIDYL)PYRIDINE	=	NICOTINE
METHYLSTYRENE	=	VINYLTOLUENE
ALPHA-METHYLSTYRENE	=	ALPHA-METHYLSTYRENE
METHYL SULFHYDRATE	=	METHYL MERCAPTAN
METHYL SULFIDE	=	DIMETHYL SULFIDE
4-(METHYLSULFONYL)-2,6-DINITRO-N,N-DIPROPYLANILINE	=	NITRALIN
METHYL SULFOXIDE	=	DIMETHYL SULFOXIDE
METHYL THIRAM	=	THIRAM
METHYLTRICHLOROSILANE	=	METHYLTRICHLOROSILANE
METHYL TUADS	=	THIRAM
METHYL VINYL ETHER	=	VINYL METHYL ETHER, INHIBITED
METHYL VINYL KETONE	=	METHYL VINYL KETONE
METHYL ZINC	=	DIMETHYLZINC
MH	=	MALEIC HYDRAZIDE
MIBC	=	METHYL AMYL ALCOHOL
MIBC	=	METHYL ISOBUTYL CARBINOL
MIBK	=	METHYL ISOBUTYL KETONE
MIC	=	METHYL AMYL ALCOHOL
MIC	=	METHYL ISOBUTYL CARBINOL

SYNONYM	COMPOUND NAME
MIDDLE OIL	CARBOLIC OIL
MIK	METHYL ISOBUTYL KETONE
MILD MERCURY CHLORIDE	MERCUROUS CHLORIDE
MILK ACID	LACTIC ACID
MINERAL CARBON	CHARCOAL
MINERAL CHARCOAL	CHARCOAL
MINERAL COLZA OIL	OIL: MINERAL SEAL
MINERAL OIL	OIL: MINERAL
MINERAL SEAL OIL	OIL: MINERAL SEAL
MINERAL SPIRITS	MINERAL SPIRITS
MITIS GREEN	COPPER ACETOARSENITE
MIXED PRIMARY AMYL NITRATES	N-AMYL NITRATE
MIXTURE OF BENZENE, TOLUENE, AND XYLENES	NAPHTHA COAL TAR
MIXTURE OF O- AND S-(2-(ETHYLTHIO)ETHYL)PHOSPHOROTHIDIC ACID, O,O-DIETHYL ESTER	DEMETON
MMH	METHYLHYDRAZINE
MOHRS SALT	FERROUS AMMONIUM SULFATE
MOLYBDENUM TRIOXIDE	MOLYBDIC TRIOXIDE
MOLYBDIC ACID, 85 PER CENT	AMMONIUM MOLYBDATE
MOLYBDIC ANHYDRIDE	MOLYBDIC TRIOXIDE
MOLYBDIC TRIOXIDE	MOLYBDIC TRIOXIDE
MONDUR TDS	TOLUENE 2,4-DIISOCYANATE (TDI)
MONOAMMONIUM ORTHOPHOSPHATE	AMMONIUM PHOSPHATE
MONOBROMOBENZENE	BROMOBENZENE
MONOBROMOMETHANE	METHYL BROMIDE
MONO-N-BUTYLAMINE	N-BUTYLAMINE
MONOCALCIUM PHOSPHATE,MONOHYDRATE	CALCIUM PHOSPHATE
MONOCHLORACETIC ACID, ETHYL ESTER	ETHYL CHLOROACETATE
MONOCHLORETHANE	ETHYL CHLORIDE
MONOCHLORETHANOIC ACID, ETHYL ESTER	ETHYL CHLOROACETATE
MONOCHLOROACETIC ACID	MONOCHLOROACETIC ACID
MONOCHLOROBENZENE	CHLOROBENZENE
MONOCHLORODIFLUOROMETHANE	MONOCHLORODIFLUOROMETHANE
MONOCHLOROMETHYL ETHER	CHLOROMETHYL METHYL ETHER
MONOETHANOLAMINE	MONOETHANOLAMINE
MONOETHYLAMINE	ETHYLAMINE
MONOETHYLENE GLYCOL	ETHYLENE GLYCOL
MONOFLUORO ETHYLENE	VINYL FLUORIDE, INHIBITED
MONOGLYME	ETHYLENE GLYCOL DIMETHYL ETHER
MONOHYDRATE	CALCIUM PHOSPHATE
MONOISOBUTYLAMINE	ISOBUTYLAMINE
MONOISOPROPANOLAMINE	MONOISOPROPANOLAMINE
MONOISOPROPYLAMINE	ISOPROPYLAMINE
MONOMETHYLAMINE, ANHYDROUS	METHYLAMINE
MONOMETHYLHYDRAZINE	METHYLHYDRAZINE
MONONITROGEN MONOXIDE	NITRIC OXIDE
MONO PE	PENTAERYTHRITOL
MONOSODIUM METHANEARSONATE	METHANEARSONIC ACID, SODIUM SALTS
MONOSODIUM METHYL ARSONATE	METHANEARSONIC ACID, SODIUM SALTS
MONOXIDE	CARBON MONOXIDE
MORPHOLINE	MORPHOLINE
MORTOPAL	TETRAETHYL PYROPHOSPHATE
MOSS GREEN	COPPER ACETOARSENITE
MOTOR FUEL ANTI-KNOCK COMPOUNDS CONTAINIG LEAD ALKYLS	MOTOR FUEL ANTI-KNOCK COMPOUNDS CONTAINIG LEAD ALKYLS
MOTOR OIL	OIL: LUBRICATING
MOTOR SPIRIT	GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)
MPT	METHYL PARATHION
MPTD	METHYL PHOSPHONOTHIOIC DICHLORIDE(ANHYD)
MSMA	METHANEARSONIC ACID, SODIUM SALTS

SYNONYM		COMPOUND NAME
MULTRATHANE M	=	DIPHENYLMETHANEDIISOCYANATE (PCI)
MURIATIC ACID	=	HYDROCHLORIC ACID
MYRISTIC ALCOHOL	=	TETRADECANOL
MYRISTYL ALCOHOL	=	TETRADECANOL
NABAM	=	NABAM
NACCONATE 100	=	TOLUENE 2,4-DIISOCYANATE (TDI)
NACCONATE 300	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
NADONE	=	CYCLOHEXANONE
NAPHTHA	=	MINERAL SPIRITS
NAPHTHA COAL TAR	=	NAPHTHA COAL TAR
NAPHTHA SOLVENT	=	NAPHTHA SOLVENT
NAPHTHA STODDARD SOLVENT	=	NAPHTHA STODDARD SOLVENT
NAPTHA VM + P (75 PER CENT NAPTHA)	=	NAPTHA VM + P (75 PER CENT NAPTHA)
NAPHTHALANE	=	DECAHYDRONAPHTHALENE
NAPHTHALENE, MOLTEN	=	NAPHTHALENE, MOLTEN
NAPHTHALIN	=	NAPHTHALENE, MOLTEN
NAPHTHANE	=	DECAHYDRONAPHTHALENE
NAPTHENIC ACIDS	=	NAPTHENIC ACIDS
ALPHA-NAPHTHYLAMINE	=	1-NAPHTHYLAMINE
1-NAPHTHYLAMINE	=	1-NAPHTHYLAMINE
1-NAPHTHYL N-METHYLCARBAMATE	=	CARBARYL
NATURAL GASOLINE	=	GASOLINE: CASINGHEAD
NEATSFOOT OIL	=	OIL: NEATSFOOT
NECATORINA	=	CARBON TETRACHLORIDE
NEOHEXANE	=	NEOHEXANE
NEUTRAL AMMONIUM FLUORIDE	=	AMMONIUM FLUORIDE
NEUTRAL ANHYDROUS CALCIUM HYPOCHLORITE	=	CALCIUM HYPOCHLORITE
NEUTRAL LEAD ACETATE	=	LEAD ACETATE
NEUTRAL NICOTINE SULFATE	=	NICOTINE SULFATE
NEUTRAL POTASSIUM CHROMATE	=	POTASSIUM CHROMATE
NEUTRAL SODIUM CHROMATE,ANHYDROUS	=	SODIUM CHROMATE
NEUTRAL VERDIGRIS	=	COPPER ACETATE
NICKEL ACETATE	=	NICKEL ACETATE
NICKEL ACETATE TETRAHYDRATE	=	NICKEL ACETATE
NICKEL AMMONIUM SULFATE	=	NICKEL AMMONIUM SULFATE
NICKEL AMMONIUM SULFATE HEXAHYDRATE	=	NICKEL AMMONIUM SULFATE
NICKEL BROMIDE	=	NICKEL BROMIDE
NICKEL BROMIDE TRIHYDRATE	=	NICKEL BROMIDE
NICKEL CARBONYL	=	NICKEL CARBONYL
NICKEL CHLORIDE	=	NICKEL CHLORIDE
NICKEL CHLORIDE	=	NICKEL CHLORIDE
NICKEL CYANIDE	=	NICKEL CYANIDE
NICKEL (II) FLUOBORATE	=	NICKEL FLUOROBORATE
NICKEL FLUOROBORATE SOLUTION	=	NICKEL FLUOROBORATE
NICKEL FLUOROBORATE	=	NICKEL FLUOROBORATE
NICKEL FORMATE	=	NICKEL FORMATE
NICKEL FORMATE DIHYDRATE	=	NICKEL FORMATE
NICKEL NITRATE	=	NICKEL NITRATE
NICKEL NITRATE HEXAHYDRATE	=	NICKEL NITRATE
NICKEL SULFATE	=	NICKEL SULFATE
NICKEL TETRACARBONYL	=	NICKEL CARBONYL
NICKELOUS ACETATE	=	NICKEL ACETATE
NICKELOUS SULFATE	=	NICKEL SULFATE
NICOTINE	=	NICOTINE
NICOTINE SULFATE	=	NICOTINE SULFATE
NIFOS	=	TETRAETHYL PYROPHOSPHATE
NITRALIN	=	NITRALIN
NITRAM	=	AMMONIUM NITRATE
O-NITRANILINE	=	2-NITROANILINE
P-NITRANILINE	=	4-NITROANILINE
NITREX NITROGEN SOLUTIONS (NON-PRESSURE)	=	AMMONIUM NITRATE-UREA SOLUTION
NITRIC ACID	=	NITRIC ACID
NITRIC ACID, ALUMINUM SALT	=	ALUMINUM NITRATE

SYNONYM	COMPOUND NAME
NITRIC ACID, IRON (III) SALT	FERRIC NITRATE
NITRIC ACID, LEAD (II) SALT	LEAD NITRATE
NITRIC OXIDE	NITRIC OXIDE
NITRILOTRIACETIC ACID AND SALTS	NITRILOTRIACETIC ACID AND SALTS
2,2',2"-NITRILOTRIETHANOL	TRIETHANOLAMINE
O-NITROANILINE	2-NITROANILINE
4-NITROANILINE	4-NITROANILINE
P-NITROANILINE	4-NITROANILINE
2-NITROANILINE	2-NITROANILINE
NITROBENZENE	NITROBENZENE
NITROBENZOL	NITROBENZENE
NITROCARBOL	NITROMETHANE
NITROCELLULOSE GUM	COLLODION
NITROCELLULOSE SOLUTION	COLLODION
NITROCHLOROFORM	CHLOROPICRIN, LIQUID
NITROETHANE	NITROETHANE
NITROGEN DIOXIDE	NITROGEN TETROXIDE
NITROGEN, LIQUEFIED	NITROGEN, LIQUEFIED
NITROGEN MONOXIDE	NITRIC OXIDE
NITROGEN PEROXIDE	NITROGEN TETROXIDE
NITROGEN TETROXIDE	NITROGEN TETROXIDE
NITROMETHANE	NITROMETHANE
O-NITROPHENOL	2-NITROPHENOL
2-NITROPHENOL	2-NITROPHENOL
P-NITROPHENOL	4-NITROPHENOL
4-NITROPHENOL	4-NITROPHENOL
SEC-NITROPROPANE	2-NITROPROPANE
2-NITROPROPANE	2-NITROPROPANE
NITROSYL CHLORIDE	NITROSYL CHLORIDE
NITROTRICHLOROMETHANE	CHLOROPICRIN, LIQUID
NITROUS ETHER	ETHYL NITRITE
NITROUS OXIDE	NITROUS OXIDE
N-NONANE	NONANE
NONANE	NONANE
NONANOL	NONANOL
1-NONANOL	NONANOL
5-NONANONE	DI-N-BUTYL KETONE
NONENE	NONENE
1-NONENE	1-NONENE
NONENE (NON-LINEAR)	NONENE
NONYL ALCOHOL	NONANOL
NONYLCARBINOL	N-DECYL ALCOHOL
1-NONYLENE	1-NONENE
N-NONYLETHYLENE	1-UNDECENE
NONYLPHENOL	NONYLPHENOL
NORMAL AMYL ALCOHOL	N-AMYL ALCOHOL
NORMAL BUTYL ACETATE	N-BUTYL ACETATE
NORMAL BUTYL ACRYLATE	N-BUTYL ACRYLATE
NORMAL BUTYL ALCOHOL	N-BUTYL ALCOHOL
NORMAL BUTYRALDEHYDE	N-BUTYRALDEHYDE
NORMAL DECYL ALCOHOL	N-DECYL ALCOHOL
NORMAL LEAD ACETATE	LEAD ACETATE
NORMAL PROPYL ACETATE	N-PROPYL ACETATE
NORMAL PROPYL ALCOHOL	N-PROPYL ALCOHOL
NORVALAMINE	N-BUTYLAMINE
2-NP	2-NITROPROPANE
NTA	NITRILOTRIACETIC ACID AND SALTS
1,2,4,5,6,7,8,8-OCTACHLORO-2,3,3A,4,7,7A-HEXAHYDRO-4,7-METHANOINDENE	CHLORDANE
OCTACHLOROCAMPHENE	TOXAPHENE
OCTADECANOIC ACID	STEARIC ACID
CIS-9-OCTADECENOIC ACID	OLEIC ACID
OCTADECYLDIMETHYLBENZYLAMMONIUM CHLORIDE	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE

SYNONYM		COMPOUND NAME
CIS-OCTADECYLENIC ACID	=	OLEIC ACID
CIS-(DELTA 9)-OCTADECYLENIC ACID	=	OLEIC ACID
N-OCTADECYLIC ACID	=	STEARIC ACID
OCTANE	=	OCTANE
OCTA-KLOR	=	CHLORDANE
N-OCTANE	=	OCTANE
OCTANOL	=	OCTANOL
1-OCTANOL	=	OCTANOL
1-OCTENE	=	1-OCTENE
OCTOCHLOROCAMPHENE	=	TOXAPHENE
OCTOIL	=	DIOCTYL PHTHALATE
OCTYL ALCOHOL	=	OCTANOL
OCTYL ALDEHYDE	=	ETHYLHEXALDEHYDE
OCTYL CARBINOL	=	NONANOL
ALPHA-OCTYLENE	=	1-OCTENE
OCTYL EPOXY TALLATE	=	OCTYL EPOXY TALLATE
300 DEG OIL	=	OIL: MINERAL SEAL
OIL: ABSORPTION	=	OIL: ABSORPTION
OIL: CASTOR	=	OIL: CASTOR
OIL: CLARIFIED	=	OIL: CLARIFIED
OIL: COAL TAR	=	OIL: COAL TAR
OIL: COTTONSEED	=	OIL: COTTONSEED
OIL: CRUDE	=	OIL: CRUDE
OIL: DIESEL	=	OIL: DIESEL
OIL: FISH	=	OIL: FISH
OIL: LUBRICATING	=	OIL: LUBRICATING
OIL: MINERAL	=	OIL: MINERAL
OIL: MINERAL SEAL	=	OIL: MINERAL SEAL
OIL: MOTOR	=	OIL: MOTOR
OIL: NEATSFOOT	=	OIL: NEATSFOOT
OIL OF BITTER ALMOND	=	BENZALDEHYDE
OIL OF MERBANE	=	NITROBENZENE
OIL OF VITRIOL	=	SULFURIC ACID
OIL: OLIVE	=	OIL: OLIVE
OIL: PEANUT	=	OIL: PEANUT
OIL: PENETRATING	=	OIL: PENETRATING
OIL: RANGE	=	OIL: RANGE
OIL: RESIN	=	OIL: RESIN
OIL: ROAD	=	OIL: ROAD
OIL: ROSIN	=	OIL: ROSIN
OIL, TANNERS	=	OIL, TANNERS
OILS EDIBLE: COCONUT	=	OILS EDIBLE: COCONUT
OILS EDIBLE, LARD	=	OILS EDIBLE, LARD
OILS EDIBLE: PALM	=	OILS EDIBLE: PALM
OILS EDIBLE: SAFFLOWER	=	OILS EDIBLE: SAFFLOWER
OILS EDIBLE: TUCUM	=	OILS EDIBLE: TUCUM
OILS MISCELLANEOUS: CROTON	=	OILS MISCELLANEOUS: CROTON
OILS MISCELLANEOUS: LINSEED	=	OILS MISCELLANEOUS: LINSEED
OILS MISCELLANEOUS: TURBINE	=	OILS MISCELLANEOUS: TURBINE
OIL: SOYA BEAN	=	OIL: SOYA BEAN
OIL: SPERM	=	OIL: SPERM
OIL: SPINDLE	=	OIL: SPINDLE
OIL: SPRAY	=	OIL: SPRAY
OIL: TALL	=	OIL: TALL
OIL: TRANSFORMER	=	OIL: TRANSFORMER
OIL: VEGETABLE	=	OIL: VEGETABLE
OLEFIANT GAS	=	ETHYLENE
OLEIC ACID	=	OLEIC ACID
OLEIC ACID, AMMONIUM SALT	=	AMMONIUM OLEATE
OLEIC ACID, POTASSIUM SALT	=	OLEIC ACID, POTASSIUM SALT
OLEIC ACID, SODIUM SALT	=	OLEIC ACID, SODIUM SALT
OLEUM	=	OLEUM
OLIVE OIL	=	OIL: OLIVE

SYNONYM		COMPOUND NAME
OPAL	=	TRICHLOROPHENOL
ONA	=	2-NITROANILINE
ONP	=	2-NITROPHENOL
ORPIMENT	=	ARSENIC TRISULFIDE
ORTHOARSENIC ACID	=	ARSENIC ACID
ORTHOBORIC ACID	=	BORIC ACID
ORTHOCIDE	=	CAPTAN
ORTHODICHLOROBENZENE	=	O-DICHLOROBENZENE
ORTHO-DIHYDROXYBENZENE	=	CATECHOL
ORTHOPHOSPHORIC ACID	=	PHOSPHORIC ACID
ORTHOTITANIC ACID,TETRABUTYL ESTER	=	TETRABUTYL TITANATE
ORTHOXYLENE	=	O-XYLENE
OXAL	=	GLYOXAL, 40% SOLUTION
OXALDEHYDE	=	GLYOXAL, 40% SOLUTION
OXALIC ACID	=	OXALIC ACID
OXALIC ACID, DIAMMONIUM SALT	=	AMMONIUM OXALATE
OXALIC ACID DINITRILE	=	CYANOGEN
OXALIC ACID, FERROUS SALT	=	FERROUS OXALATE
OXALONITRILE	=	CYANOGEN
OXAMMONIUM SULFATE	=	HYDROXYLAMINE SULFATE
3-OXA-1,5-PENTANEDIOL	=	DIETHYLENE GLYCOL
2-OXETANONE	=	BETA-PROPIOLACTONE
OXIDES OF NITROGEN	=	NITROGEN TETROXIDE
OXIRANE	=	ETHYLENE OXIDE
ALPHA-OXODIPHENYLMETHANE	=	BENZOPHENONE
ALPHA-OXODITANE	=	BENZOPHENONE
2,2 OXYBISETHANOL	=	DIETHYLENE GLYCOL
OXYGEN, LIQUEFIED	=	OXYGEN, LIQUEFIED
OXYLITE	=	DIBENZOYL PEROXIDE
OXYPHENIC ACID	=	CATECHOL
OXYTOLUENES	=	CRESOLS
PAINT DRIER	=	COPPER NAPHTHENATE
PAINTERS NAPHTHA	=	NAPTHA VM + P (75 PER CENT NAPTHA)
PALM BUTTER	=	OILS EDIBLE: PALM
PALM FRUIT OIL	=	OILS EDIBLE: PALM
PALM SEED OIL	=	OILS EDIBLE: TOCOL
PAN	=	PHTHALIC ANHYDRIDE
PAPI	=	POLYMETHYLENE POLYPHENYL ISOCYANATE
PARADI	=	P-DICHLOROBENZENE
PARADICHLOROBENZENE	=	P-DICHLOROBENZENE
PARADOW	=	P-DICHLOROBENZENE
PARAFORMALDEHYDE	=	PARAFORMALDEHYDE
PARA HYDROGEN	=	HYDROGEN, LIQUEFIED
PARA-MENTHA-1,8-DIENE	=	DIPENTENE
PARAMOTH	=	P-DICHLOROBENZENE
PARANAPHTHALENE	=	ANTHRACENE
PARATHION, LIQUID	=	PARATHION, LIQUID
PARATHION-METHYL	=	METHYL PARATHION
PARAXYLENE	=	P-XYLENE
PARIS GREEN	=	COPPER ACETOARSENITE
PARROT GREEN	=	COPPER ACETOARSENITE
PATENT ALUM	=	ALUMINUM SULFATE
PCB	=	POLYCHLORINATED BIPHENYL (PCB)
PE	=	PENTAERYTHRITOL
PEANUT OIL	=	OIL: PEANUT
PEARL WHITE	=	BISMUTH OXYCHLORIDE
PELARGONIC ALCOHOL	=	NONANOL
PENETRATING OIL	=	OIL: PENETRATING
PENTA	=	PENTACHLOROPHENOL
PENTABORANE	=	PENTABORANE
(9)-PENTABORON NONAHYDRIDE	=	PENTABORANE
PENTACHLOROPHENOL	=	PENTACHLOROPHENOL
PENTADECANOL	=	PENTADECANOL
1-PENTADECANOL	=	PENTADECANOL
PENTADECANOL	=	LINEAR ALCOHOLS (12-15 CARBONS)

SYNONYM		COMPOUND NAME
PENTADECYL ALCOHOL	=	PENTADECANOL
PENTADECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
PENTAERYTHRITE	=	PENTAERYTHRITOL
PENTAERYTHRITOL	=	PENTAERYTHRITOL
PENTAMETHYLENE	=	CYCLOPENTANE
PENTANAL	=	VALERALDEHYDE
PENTANE	=	PENTANE
1,5-PENTANEDIAL SOLUTION	=	GLUTARALDEHYDE SOLUTION
2,4-PENTANEDIONE	=	ACETYLACETONE
1-PENTANETHIOL	=	N-AMYL MERCAPTAN
1-PENTANOL	=	N-AMYL ALCOHOL
PENTEK	=	PENTAERYTHRITOL
1-PENTENE	=	1-PENTENE
PENTYL ACETATES	=	AMYL ACETATE
PENTYL ALCOHOL	=	N-AMYL ALCOHOL
SEC-PENTYL CARBINOL	=	ETHYL BUTANOL
1-PENTYL CHLORIDE	=	N-AMYL CHLORIDE
PENTYL METHYL KETONE	=	N-AMYL METHYL KETONE
PENTYLSILICON TRICHLORIDE	=	N-AMYLTRICHLOROSILANE
PERACETIC ACID	=	PERACETIC ACID
PERCARBAMIDE	=	UREA PEROXIDE
PERCHLORIC ACID	=	PERCHLORIC ACID
PERCHLORIC ACID SOLUTION	=	PERCHLORIC ACID
PERCHLOROCYCLOPENTADIENE	=	HEXACHLOROCYCLOPENTADIENE
PERCHLOROETHYLENE	=	TETRACHLOROETHYLENE
PERCHLOROMETHANE	=	CARBON TETRACHLORIDE
PERCHLOROMETHYL MERCAPTAN	=	PERCHLOROMETHYL MERCAPTAN
PERCLENE	=	TETRACHLOROETHYLENE
PERHYDROL-UREA	=	UREA PEROXIDE
PERHYDRONAPHTHALENE	=	DECAHYDRONAPHTHALENE
PERK	=	TETRACHLOROETHYLENE
PEROXIDE	=	HYDROGEN PEROXIDE
PEROXYACETIC ACID	=	PERACETIC ACID
PEROXYDICARBONIC ACID, DIISOPROPYL ESTER	=	ISOPROPYL PERCARBONATE
PEROXY-DICARBONIC ACID, BIS(1-METHYLETHYL)ESTER	=	ISOPROPYL PERCARBONATE
PEROXY-DICARBONIC ACID, BIS (1-METHYLETHYL) ESTER	=	ISOPROPYL PERCARBONATE
PEROXYDISULFURIC ACID, DIAMMONIUM SALT	=	AMMONIUM PERSULFATE
PETROHOL	=	ISOPROPYL ALCOHOL
PETROL	=	GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)
PETROLATUM	=	PETROLATUM
PETROLATUM JELLY	=	PETROLATUM
PETROLEUM	=	OIL: CRUDE
PETROLEUM ASPHALT	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
PETROLEUM ASPHALT	=	OIL: ROAD
PETROLEUM ASPHALT	=	ASPHALT
PETROLEUM DISTILLATE	=	DISTILLATE:FLASHED FEED STOCKS
PETROLEUM DISTILLATE	=	DISTILLATE:STRAIGHT RUN
PETROLEUM INSULATING OIL	=	OIL: TRANSFORMER
PETROLEUM JELLY	=	PETROLATUM
PETROLEUM NAPHTHA	=	PETROLEUM NAPHTHA
PETROLEUM PITCH	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
PETROLEUM RESIDUE	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
PETROLEUM SOLVENT	=	NAPHTHA SOLVENT
PETROLEUM SOLVENT	=	NAPHTHA STODDARD SOLVENT
PETROLEUM SOLVENT	=	NAPTHA VP + P (75 PER CENT NAPTHA)
PETROLEUM SOLVENT	=	PETROLEUM NAPHTHA
PETROLEUM SPIRITS	=	MINERAL SPIRITS

SYNONYM	COMPOUND NAME
PETROLEUM TAILINGS	ASPHALT BLENDING STOCK:ROOFERS FLUX
PETROLEUM WAX	WAXES: PARAFFIN
PHELLANDRENE	DIPENTENE
PHENACHLOR	TRICHLOROPHENOL
PHENACYL CHLORIDE	CHLOROACETOPHENONE
PHENETHYLENE	STYRENE
PHENIC ACID	PHENOL
PHENOL	PHENOL
PHENOXYBENZENE	DIPHENYL ETHER
PHENYLAMINE	ANILINE
N-PHENYLANILINE	DIPHENYLAMINE
PHENYLARSENIC DICHLORIDE	PHENYLDICHLOROARSINE, LIQUID
PHENYL BROMIDE	BROMOBENZENE
PHENYLCARBINOL	BENZYL ALCOHOL
PHENYL CHLORIDE	CHLOROBENZENE
PHENYL CHLOROMETHYL KETONE	CHLOROACETOPHENONE
PHENYLCYANIDE	BENZONITRILE
1-PHENYLDECANE	N-DECYLBENZENE
PHENYLDICHLOROARSINE, LIQUID	PHENYLDICHLOROARSINE, LIQUID
1-PHENYLDODECANE	DODECYLBENZENE
PHENYLETHANE	ETHYLBENZENE
PHENYLETHYLENE	STYRENE
PHENYL ETHER	DIPHENYL ETHER
PHENYLHYDRAZINE HYDROCHLORIDE	PHENYLHYDRAZINE HYDROCHLORIDE
PHENYLHYDRAZINIUM CHLORIDE	PHENYLHYDRAZINE HYDROCHLORIDE
PHENYL HYDROXIDE	PHENOL
PHENYLMETHANOL	BENZYL ALCOHOL
PHENYLMETHYL ALCOHOL	BENZYL ALCOHOL
PHENYLMETHYL AMINE	BENZYLAMINE
PHENYLPHOSPHINE DICHLORIDE	BENZENE PHOSPHORUS DICHLORIDE
PHENYLPHOSPHINE THIODICHLORIDE	BENZENE PHOSPHORUS THIODICHLORIDE
PHENYLPHOSPHONOTHIOIC DICHLORIDE	BENZENE PHOSPHORUS THIODICHLORIDE
PHENYL PHOSPHONOUS DICHLORIDE	BENZENE PHOSPHORUS DICHLORIDE
PHENYLPROPYLENE	ALPHA-METHYLSTYRENE
1-PHENYLTETRADECANE	TETRADECYLBENZENE
1-PHENYLUNDECANE	N-UNDECYLBENZENE
PHOSGENE	PHOSGENE
PHOSPHORIC ACID	PHOSPHORIC ACID
PHOSPHORIC ACID TRIETHYLENEIMIDE	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
PHOSPHORIC SULFIDE	PHOSPHORUS PENTASULFIDE
PHOSPHORODICHLORIDIC ACID, ETHYL ESTER	ETHYL PHOSPHORODICHLORIDATE
PHOSPHOROTHIOIC ACID, O,O-DIETHYL ESTER	DEMETON
PHOSPHOROTHIOIC ACID,O,O-DIETHYL O-P-NITROPHENYL ESTER	PARATHION, LIQUID
PHOSPHORUS BROMIDE	PHOSPHORUS TRIBROMIDE
PHOSPHORUS OXYCHLORIDE	PHOSPHORUS OXYCHLORIDE
PHOSPHORUS PENTASULFIDE	PHOSPHORUS PENTASULFIDE
PHOSPHORUS PERSULFIDE	PHOSPHORUS PENTASULFIDE
PHOSPHORUS TRIBROMIDE	PHOSPHORUS TRIBROMIDE
PHOSPHORUS TRICHLORIDE	PHOSPHORUS TRICHLORIDE
PHOSPHORUS, RED	PHOSPHORUS, RED
PHOSPHORUS, WHITE	PHOSPHORUS, WHITE
PHOSPHORYL CHLORIDE	PHOSPHORUS OXYCHLORIDE
PHOSPHORYL CHLORIDE	PHOSPHORUS OXYCHLORIDE
PHOTOPHOR	CALCIUM PHOSPHIDE
PHTHALANDIONE	PHTHALIC ANHYDRIDE
M-PHTHALIC ACID	ISOPHTHALIC ACID
PHTHALIC ACID ANHYDRIDE	PHTHALIC ANHYDRIDE
PHTHALIC ACID, BENZYL BUTYL ESTER	BENZYL N-BUTYL PHTHALATE
PHTHALIC ACID, DIAMYL ESTER	DI-N-AMYL PHTHALATE
PHTHALIC ACID, DIBUTYL ESTER	DIBUTYL PHTHALATE
PHTHALIC ACID, DIETHYL ESTER	DIETHYL PHTHALATE
PHTHALIC ACID, DIHEPTYL ESTER	DI-N-HEPTYL PHTHALATE
PHTHALIC ACID, DIISODECYL ESTER	DIISODECYL PHTHALATE

SYNONYM		COMPOUND NAME
PHTHALIC ACID, DIPENTYL ESTER	=	DI-N-AMYL PHTHALATE
PHTHALIC ACID, BIS(2-ETHYLHEXYL)ESTER	=	DIOCTYL PHTHALATE
PHTHALIC ACID, BIS(8-METHYLNONYL)ESTER	=	DIISODECYL PHTHALATE
PHTHALIC ANHYDRIDE	=	PHTHALIC ANHYDRIDE
PHYTAR 160	=	SODIUM CACODYLATE
PHYTAR 560	=	SODIUM CACODYLATE
PICFUME	=	CHLOROPICRIN, LIQUID
PIMELIC KETONE	=	CYCLOHEXANONE
PIPERAZIDINE	=	PIPERAZINE
PIPERAZINE	=	PIPERAZINE
PITTSBURG PX-138	=	DIOCTYL PHTHALATE
PLANAVIN	=	NITRALIN
PLANT SPRAY OIL	=	OILS SPRAY
PLASKON MONOMER	=	TRIFLUOROCHLOROETHYLENE
PLASTICIZER ODP	=	DIISODECYL PHTHALATE
PLASTIC LATEX	=	LATEX, LIQUID SYNTHETIC
PLUMBOUS ARSENATE	=	LEAD ARSENATE
PLUMBOUS FLUORIDE	=	LEAD FLUORIDE
PLUMBOUS OXIDE	=	LITHARGE
PLURACOL POLYOL	=	POLYPROPYLENE GLYCOL
PNA	=	4-NITROANILINE
PNP	=	4-NITROPHENOL
POLY (DIMETHYLSILOXANE)	=	DIMETHYL POLYSILOXANE
POLYBUTENE	=	POLYBUTENE
POLYCHLORINATED BIPHENYL (PCB)	=	POLYCHLORINATED BIPHENYL (PCB)
POLYCHLOROPOLYPHENYLS	=	POLYCHLORINATED BIPHENYL (PCB)
POLYFORMALDEHYDE	=	PARAFORMALDEHYDE
POLYISOBUTYLENE PLASTICS	=	POLYBUTENE
POLYISOBUTYLENE RESINS	=	POLYBUTENE
POLYISOBUTYLENE WAXES	=	POLYBUTENE
POLYMETHYLENE POLYPHENYL ISOCYANATE	=	POLYMETHYLENE POLYPHENYL ISOCYANATE
POLYOXPROPYLENE ETHER,PPG	=	POLYPROPYLENE GLYCOL
POLY(OXYETHYL)DODECYL ETHER	=	ETHOXYLATED DODECANOL
POLY(OXYETHYL)LAURYL ETHER	=	ETHOXYLATED DODECANOL
POLY(OXYETHYL)MYRISTYL ETHER	=	ETHOXYLATED TETRADECANOL
POLY(OXYETHYL)PENTADECYL ETHER	=	ETHOXYLATED PENTADECANOL
POLY(OXYETHYL)TETRADECYL ETHER	=	ETHOXYLATED TETRADECANOL
POLY(OXYETHYL)TRIDECYL ETHER	=	ETHOXYLATED TRIDECANOL
POLYOXYMETHYLENE	=	PARAFORMALDEHYDE
POLYOXYMETHYLENE GLYCOL	=	PARAFORMALDEHYDE
POLYOXYPROPYLENE GLYCOL	=	POLYPROPYLENE GLYCOL
POLYOXYPROPYLENE GLYCOL METHYL ETHER	=	POLYPROPYLENE GLYCOL METHYL ETHER
POLYPHOSPHORIC ACID	=	POLYPHOSPHORIC ACID
POLYPROPYLENE	=	POLYPROPYLENE
POLYPROPYLENE GLYCOL	=	POLYPROPYLENE GLYCOL
POLYPROPYLENE GLYCOL METHYL ETHER	=	POLYPROPYLENE GLYCOL METHYL ETHER
POLY(PROPYLENE GLYCOL)METHYL ETHER	=	POLYPROPYLENE GLYCOL METHYL ETHER
POLYPROPYLENE GLYCOLS P400 TO P4000	=	POLYPROPYLENE GLYCOL
POLY-SOLV	=	DIETHYLENE GLYCOL DIMETHYL ETHER
POLY-SOLV DB	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
POLY-SOLV DE	=	DIETHYLENE GLYCOL MONOETHYL ETHER
POLY-SOLV DM	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
POLY-SOLV EB	=	ETHYLENE GLYCOL MONOBUTYL ETHER
POLY-SOLV EE	=	ETHYLENE GLYCOL MONOETHYL ETHER
POLY-SOLV EE ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
POLY-SOLV EM	=	ETHYLENE GLYCOL MONOMETHYL ETHER
POTASSIUM ACID ARSENATE	=	POTASSIUM ARSENATE
POTASSIUM ACID OXALATE	=	POTASSIUM BINOXALATE
POTASSIUM ANTIMONYL TARTRATE	=	ANTIMONY POTASSIUM TARTRATE
POTASSIUM ARSENATE	=	POTASSIUM ARSENATE
POTASSIUM BICHROMATE	=	POTASSIUM DICHROMATE
POTASSIUM BINOXALATE	=	POTASSIUM BINOXALATE
POTASSIUM CHLORATE	=	POTASSIUM CHLORATE

SYNONYM		COMPOUND NAME
POTASSIUM CHROMATE	=	POTASSIUM CHROMATE
POTASSIUM CHROMATE(VI)	=	POTASSIUM CHROMATE
POTASSIUM CYANIDE	=	POTASSIUM CYANIDE
POTASSIUM DICHLOROISOCYANURATE	=	POTASSIUM DICHLORO-S-TRIAZINETRIONE
POTASSIUM DICHLORO-S-TRIAZINETRIONE	=	POTASSIUM DICHLORO-S-TRIAZINETRIONE
POTASSIUM DICHROMATE	=	POTASSIUM DICHROMATE
POTASSIUM HYDROXIDE SOLUTION	=	CAUSTIC POTASH SOLUTION
POTASSIUM IODIDE	=	POTASSIUM IODIDE
POTASSIUM DIHYDROGEN ARSENATE	=	POTASSIUM ARSENATE
POTASSIUM HYDROXIDE	=	POTASSIUM HYDROXIDE
POTASSIUM, METALLIC	=	POTASSIUM, METALLIC
POTASSIUM OLEATE	=	OLEIC ACID, POTASSIUM SALT
POTASSIUM OXALATE	=	POTASSIUM OXALATE
POTASSIUM OXALATE MONOHYDRATE	=	POTASSIUM OXALATE
POTASSIUM PERMANGANATE	=	POTASSIUM PERMANGANATE
POTASSIUM PEROXIDE	=	POTASSIUM PEROXIDE
POTASSIUM SUPEROXIDE	=	POTASSIUM PEROXIDE
POTATOSPIRIT OIL	=	ISOAMYL ALCOHOL
POTERATE	=	POTASSIUM CHLORATE
PRESERVATIVE OIL	=	OIL: PENETRATING
PRIMARY CALCIUM PHOSPHATE	=	CALCIUM PHOSPHATE
PRIME STEAM LARD	=	OILS EDIBLE, LARD
PROPADIENE-METHYLACETYLENE MIXTURE	=	METHYLACETYLENE - PROPADIENE MIXTURE
PROPALDEHYDE	=	PROPIONALDEHYDE
PROPANAL	=	PROPIONALDEHYDE
PROPANE	=	PROPANE
PROPANE-BUTANE-(PROPYLENE)	=	LIQUEFIED PETROLEUM GAS (LPG)
PROPANE-2-CARBOXYLIC ACID	=	ISOBUTYRIC ACID
PROPANECARBOXYLIC ACID	=	N-BUTYRIC ACID
1,2-PROPANEDIOL	=	PROPYLENE GLYCOL
1,2-PROPANEDIOL 1-ACRYLATE	=	HYDROXYPROPYL ACRYLATE
1,2-PROPANEDIOL 1-METHACRYLATE	=	HYDROXYPROPYL METHACRYLATE
1-PROPANETHIOL	=	N-PROPYL MERCAPTAN
2-PROPANETHIOL	=	ISOPROPYL MERCAPTAN
PROPANE-1-THIOL	=	N-PROPYL MERCAPTAN
PROPANE-2-THIOL	=	ISOPROPYL MERCAPTAN
1,2,3-PROPANETRIOL	=	GLYCERINE
PROPANOIC ACID	=	PROPIONIC ACID
PROPANOIC ANHYDRIDE	=	PROPIONIC ANHYDRIDE
1-PROPANOL	=	N-PROPYL ALCOHOL
2-PROPANOL	=	ISOPROPYL ALCOHOL
PROPANOLIDE	=	BETA-PROPIOLACTONE
2-PROPANONE	=	ACETONE
2-PROPENAL	=	ACROLEIN
2-PROPEN-1-OL	=	ALLYL ALCOHOL
PROPENAMIDE 50 PER CENT	=	ACRYLAMIDE
PROPENE	=	PROPYLENE
PROPENE OXIDE	=	PROPYLENE OXIDE
PROPENE POLYMER	=	POLYPROPYLENE
PROPENOIC ACID	=	ACRYLIC ACID
BETA-PROPIOLACTONE	=	BETA-PROPIOLACTONE
PROPIONALDEHYDE	=	PROPIONALDEHYDE
PROPIONIC ACID	=	PROPIONIC ACID
PROPIONIC ALDEHYDE	=	PROPIONALDEHYDE
PROPIONIC ANHYDRIDE	=	PROPIONIC ANHYDRIDE
BETA-PROPIONOLACTONE	=	BETA-PROPIOLACTONE
PROPIONYL OXIDE	=	PROPIONIC ANHYDRIDE
N-PROPYL ACETATE	=	N-PROPYL ACETATE
2-PROPYL ACETATE	=	ISOPROPYL ACETATE
PROPYL ALCOHOL	=	N-PROPYL ALCOHOL
SEC-PROPYL ALCOHOL	=	ISOPROPYL ALCOHOL
N-PROPYL ALCOHOL	=	N-PROPYL ALCOHOL
PROPYL ALDEHYDE	=	PROPIONALDEHYDE
N-PROPYLCARBINOL	=	N-BUTYL ALCOHOL
PROPYLENE	=	PROPYLENE

SYNONYM		COMPOUND NAME
PROPYLENE BUTYLENE POLYMER	=	PROPYLENE BUTYLENE POLYMER
PROPYLENE DICHLORIDE	=	DICHLOROPROPANE
PROPYLENE GLYCOL METHYL ETHER	=	PROPYLENE GLYCOL METHYL ETHER
PROPYLENE GLYCOL MONO-ACRYLATE	=	HYDROXYPROPYL ACRYLATE
PROPYLENE GLYCOL MONOMETHACRYLATE	=	HYDROXYPROPYL METHACRYLATE
PROPYLENE GYLCOL	=	PROPYLENE GYLCOL
PROPYLENIMINE	=	PROPYLENEIMINE, INHIBITED
PROPYLENE OXIDE	=	PROPYLENE OXIDE
PROPYLENE TETRAMER	=	PROPYLENE TETRAMER
PROPYLENE TETRAMER	=	DODECENE
PROPYLENE TRIMER	=	NONENE
PROPYLENEIMINE, INHIBITED	=	PROPYLENEIMINE, INHIBITED
PROPYLETHYLENE	=	1-PENTENE
N-PROPYL MERCAPTAN	=	N-PROPYL MERCAPTAN
N-N-PROPYL-1-PROPANAMINE	=	DI-N-PROPYLAMINE
PRUSSIC ACID	=	HYDROGEN CYANIDE
PSEUDOHEXYL ALCOHOL	=	ETHYL BUTANOL
PYRAZINE HEXAHYDRIDE	=	PIPERAZINE
PYRIDINE	=	PYRIDINE
PYROCATECHIN	=	CATECHOL
PYROCATECHINIC ACID	=	CATECHOL
PYROCATECHOL	=	CATECHOL
PYROCATECHUIC ACID	=	CATECHOL
PYROFAX	=	LIQUEFIED PETROLEUM GAS (LPG)
PYROGALLIC ACID	=	PYROGALLIC ACID
PYROGALLOL	=	PYROGALLIC ACID
PYROGENTISIC ACID	=	HYDROQUINONE
PYROMUCIC ALDEHYDE	=	FURFURAL
PYROXYLIC SPIRIT	=	METHYL ALCOHOL
PYROXYLIN SOLUTION	=	COLLODION
QUAKERAL	=	FURFURAL
QUICKLIME	=	CALCIUM OXIDE
QUICKSILVER	=	MERCURY
QUINOL	=	HYDROQUINONE
QUINOLINE	=	QUINOLINE
RACEMIC LACTIC ACID	=	LACTIC ACID
RANGE OIL	=	FUEL OIL: NO 1(KEROSENE)
RANGE OIL	=	KEROSENE
RANGE OIL	=	JET FUEL: JP-1(KEROSENE)
RAW LINSEED OIL	=	OILS MISCELLANEOUS: LINSEED
RC PLASTICIZER DBP	=	DIBUTYL PHTHALATE
RC PLASTICIZER DOP	=	DIOCTYL PHTHALATE
REALGAR	=	ARSENIC DISULFIDE
RED ARSENIC GLASS	=	ARSENIC DISULFIDE
RED ARSENIC SULFIDE	=	ARSENIC DISULFIDE
RED OIL	=	OLEIC ACID
RED ORPIMENT	=	ARSENIC DISULFIDE
RED OXIDE OF NITROGEN	=	NITROGEN TETROXIDE
RED TR BASE	=	4-CHLORO-O-TOLUIDINE
REFRIGERANT 152A	=	1,1-DIFLUOROETHANE
REGULOX	=	MALEIC HYDRAZIDE
RESIDUAL ASPHALT	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
RESIDUAL FUEL OIL, NO.6	=	FUEL OIL: 6
RESIDUAL FUEL OIL, NO.4	=	FUEL OIL: 4
RESIDUAL FUEL OIL, NO.5	=	FUEL OIL: 5
RESIDUAL OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
RESIN OIL	=	OIL: ROSIN
RESORCIN	=	RESORCINOL
RESORCINOL	=	RESORCINOL
RETARDER W	=	SALICYLIC ACID
RETINOL	=	OIL: RESIN
RETINOL	=	OIL: ROSIN
RHODANATE	=	SODIUM THIOCYANATE

SYNONYM		COMPOUND NAME
ROAD BINDER	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
ROAD OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
ROSIN OIL	=	OIL: RESIN
ROSINOL	=	OIL: ROSIN
ROSINOL	=	OIL: RESIN
RUBBING ALCOHOL	=	ISOPROPYL ALCOHOL
RUBY ARSENIC	=	ARSENIC DISULFIDE
SACCHAROSE	=	SUCROSE
SACCHARUM	=	SUCROSE
SAFFLOWER SEED OIL	=	OILS EDIBLE: SAFFLOWER
SAL ACETOSELLA	=	POTASSIUM BINOXALATE
SAL AMMONIAC	=	AMMONIUM CHLORIDE
SALICYLIC ACID	=	SALICYLIC ACID
SALMIAC	=	AMMONIUM CHLORIDE
SALT OF SATURN	=	LEAD ACETATE
SALT OF SORREL	=	POTASSIUM BINOXALATE
SALUFER	=	SODIUM SILICOFLUORIDE
SAL VOLATILE	=	AMMONIUM CARBONATE
SAND ACID	=	FLUOSILICIC ACID
SANTACHLOR	=	P-DICHLOROBENZENE
SANTOPHEN 20	=	PENTACHLOROPHENOL
SARALEX	=	DIAZINON
SCHEELES GREEN	=	COPPER ARSENITE
SEAL-COATING MATERIAL	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
SECONDARY AMMONIUM PHOSPHATE	=	AMMONIUM PHOSPHATE
SECONDARY BUTYL ACETATE	=	SEC-BUTYL ACETATE
SECONDARY BUTYL ALCOHOL	=	SEC-BUTYL ALCOHOL
SECONDARY CALCIUM PHOSPHATE	=	CALCIUM PHOSPHATE
SELENIC ANHYDRIDE	=	SELENIUM TRIOXIDE
SELENIOUS ANHYDRIDE	=	SELENIUM DIOXIDE
SELENIUM DIOXIDE	=	SELENIUM DIOXIDE
SELENIUM OXIDE	=	SELENIUM DIOXIDE
SELENIUM TRIOXIDE	=	SELENIUM TRIOXIDE
SENARMONTITE	=	ANTIMONY TRIOXIDE
SENTRY	=	CALCIUM HYPOCHLORITE
SEVIN	=	CARBARYL
SEXTONE	=	CYCLOHEXANONE
SHELL CHARCOAL	=	CHARCOAL
SIGNAL OIL	=	OIL: MINERAL SEAL
SILIBOND	=	ETHYL SILICATE
SILICOCHLOROFORM	=	TRICHLOROSILANE
SILICOFLUORIC ACID	=	FLUOSILICIC ACID
SILICON CHLORIDE	=	SILICON TETRACHLORIDE
SILICONE FLUIDS	=	DIMETHYL POLYSILOXANE
SILICON TETRACHLORIDE	=	SILICON TETRACHLORIDE
SILVER ACETATE	=	SILVER ACETATE
SILVER CARBONATE	=	SILVER CARBONATE
SILVER FLUORIDE	=	SILVER FLUORIDE
SILVER IODATE	=	SILVER IODATE
SILVER MONOFLUORIDE	=	SILVER FLUORIDE
SILVER NITRATE	=	SILVER NITRATE
SILVER OXIDE	=	SILVER OXIDE
SILVER SULFATE	=	SILVER SULFATE
SILVISAR 510	=	CACODYLIC ACID
SLAKED LIME	=	CALCIUM HYDROXIDE
SLOW-CURING ASPHALT	=	OIL: ROAD
SODAMIDE	=	SODIUM AMIDE
SODIUM	=	SODIUM
SODIUM ACID SULFITE	=	SODIUM BISULFITE
SODIUM ALKYLBENZENESULFONATES	=	SODIUM ALKYLBENZENESULFONATES
SODIUM ALKYL SULFATES	=	SODIUM ALKYL SULFATES
SODIUM AMIDE	=	SODIUM AMIDE
SODIUM ARSENATE	=	SODIUM ARSENATE

SYNONYM		COMPOUND NAME
SODIUM ARSENATE, DIBASIC	=	SODIUM ARSENATE
SODIUM ARSENITE	=	SODIUM ARSENITE
SODIUM AZIDE	=	SODIUM AZIDE
SODIUM BIBORATE	=	SODIUM BORATE
SODIUM BISULFIDE	=	SODIUM HYDROSULFIDE SOLUTION
SODIUM BISULFITE	=	SODIUM BISULFITE
SODIUM BORATE	=	SODIUM BORATE
SODIUM BOROHYDRIDE	=	SODIUM BOROHYDRIDE
SODIUM CACODYLATE	=	SODIUM CACODYLATE
SODIUM CETYL SULFATE SOLUTION	=	HEXADECYL SULFATE, SODIUM SALT
SODIUM CHLORATE	=	SODIUM CHLORATE
SODIUM CHROMATE	=	SODIUM CHROMATE
SODIUM CHROMATE(VI)	=	SODIUM CHROMATE
SODIUM CYANIDE	=	SODIUM CYANIDE
SODIUM DICHLOROISOCYANURATE	=	SODIUM DICHLORO-S-TRIAZINETRIONE
SODIUM DICHLORO-S-TRIAZINETRIONE	=	SODIUM DICHLORO-S-TRIAZINETRIONE
SODIUM DICHROMATE	=	SODIUM DICHROMATE
SODIUM DIMETHYLARSONATE	=	SODIUM CACODYLATE
SODIUM DIOCTYL SULFOSUCCINATE	=	DIOCTYL SODIUM SULFOSUCCINATE
SODIUM DODECYL SULFATE	=	DODECYL SULFATE, SODIUM SALT
SODIUM FERROCYANIDE	=	SODIUM FERROCYANIDE
SODIUM FLUORIDE	=	SODIUM FLUORIDE
SODIUM FLUOSILICATE	=	SODIUM SILICOFLUORIDE
SODIUM HEXAFLUOROSILICATE	=	SODIUM SILICOFLUORIDE
SODIUM HYDRIDE	=	SODIUM HYDRIDE
SODIUM HYDROGEN ALKYL SULFATE	=	SODIUM ALKYL SULFATES
SODIUM HYDROGEN SULFIDE	=	SODIUM HYDROSULFIDE SOLUTION
SODIUM HYDROSULFIDE SOLUTION	=	SODIUM HYDROSULFIDE SOLUTION
SODIUM HYDROXIDE	=	SODIUM HYDROXIDE
SODIUM HYDROXIDE SOLUTION	=	CAUSTIC SODA SOLUTION
SODIUM HYPOCHLORITE	=	SODIUM HYPOCHLORITE
SODIUM LAURYL SULFATE	=	DODECYL SULFATE, SODIUM SALT
SODIUM METAARSENITE	=	SODIUM ARSENITE
SODIUM METABISULFITE	=	SODIUM BISULFITE
SODIUM METHOXIDE	=	SODIUM METHYLATE
SODIUM METHYLATE	=	SODIUM METHYLATE
SODIUM NITRITE	=	SODIUM NITRITE
SODIUM OLEATE	=	OLEIC ACID, SODIUM SALT
SODIUM ORTHOARSENITE	=	SODIUM ARSENITE
SODIUM OXALATE	=	SODIUM OXALATE
SODIUM PHOSPHATE	=	SODIUM PHOSPHATE
SODIUM PYROBORATE	=	SODIUM BORATE
SODIUM PYROSULFITE	=	SODIUM BISULFITE
SODIUM RHODANIDE	=	SODIUM THIOCYANATE
SODIUM SILICATE	=	SODIUM SILICATE
SODIUM SILICOFLUORIDE	=	SODIUM SILICOFLUORIDE
SODIUM SULFHYDRATE	=	SODIUM HYDROSULFIDE SOLUTION
SODIUM SULFIDE	=	SODIUM SULFIDE
SODIUM SULFITE	=	SODIUM SULFITE
SODIUM SULFOCYANATE	=	SODIUM THIOCYANATE
SODIUM TETRABORATE,ANHYDROUS	=	SODIUM BORATE
SODIUM THIOCYANATE	=	SODIUM THIOCYANATE
SOLAR NITROGEN SOLUTIONS	=	AMMONIUM NITRATE-UREA SOLUTION
SOLUBLE GLASS	=	SODIUM SILICATE
SORBIT	=	SORBITOL
SORBITOL	=	SORBITOL
SORBO	=	SORBITOL
SORBOL	=	SORBITOL
SOYBEAN OIL	=	OIL: SOYA BEAN
SPECTRACIDE	=	DIAZINON
SPERM OIL	=	OIL: SPERM
SPINDLE OIL	=	OIL: SPINDLE
SPIRIT	=	ETHYL ALCOHOL
SPIRIT OF ETHER NITRITE	=	ETHYL NITRITE
SPIRITS OF TURPENTINE	=	TURPENTINE

SYNONYM		COMPOUND NAME
SPIRITS OF WINE	=	ETHYL ALCOHOL
SPOTTING NAPHTHA	=	NAPHTHA STODDARD SOLVENT
SPRAY OIL	=	OILS SPRAY
STEAM TURBINE LUBE OIL	=	OILS MISCELLANEOUS: TURBINE
STEAM TURBINE OIL	=	OILS MISCELLANEOUS: TURBINE
STEARIC ACID	=	STEARIC ACID
STEARIC ACID, AMMONIUM SALT	=	AMMONIUM STEARATE
STEAROPHANIC ACID	=	STEARIC ACID
STEARYL ALCOHOL,CRUDE	=	TALLOW FATTY ALCOHOL
STEINBUHL YELLOW	=	CALCIUM CHROMATE
STREUNEX	=	BENZENE
STYRENE	=	STYRENE
STYROL	=	STYRENE
STYROLENE	=	STYRENE
SUCROSE	=	SUCROSE
SUGAR	=	SUCROSE
SUGAR OF LEAD	=	LEAD ACETATE
SULFAMIC ACID, MONOAMMONIUM SALT	=	AMMONIUM SULFAMATE
SULFATED NEATSFOOT OIL, SODIUM SALT	=	OIL, TANNERS
SULFATE OF COPPER	=	COPPER SULFATE
SULFATE TURPENTINE	=	TURPENTINE
SULFOLANE	=	SULFOLANE
SULFOLANE-W	=	SULFOLANE
SULFONATED ALKYLBENZENE, SODIUM SALT	=	SODIUM ALKYLBENZENESULFONATES
SULFUR DIOXIDE	=	SULFUR DIOXIDE
SULFURETTED HYDROGEN	=	HYDROGEN SULFIDE
SULFURIC ACID	=	SULFURIC ACID
SULFURIC ACID, SPENT	=	SULFURIC ACID, SPENT
SULFURIC ETHER	=	ETHYL ETHER
SULFUR(LIQUID)	=	SULFUR(LIQUID)
SULFUR MONOCHLORIDE	=	SULFUR MONOCHLORIDE
SULFURYL CHLORIDE	=	SULFURYL CHLORIDE
SULPHUR (LIQUID)	=	SULFUR(LIQUID)
SULPHURETTED HYDROGEN	=	HYDROGEN SULFIDE
SUPEROXOL	=	HYDROGEN PEROXIDE
SWEDISH GREEN	=	COPPER ARSENITE
SWEET SPIRIT OF NITRE	=	ETHYL NITRITE
SYNTHETIC RUBBER LATEX	=	LATEX, LIQUID SYNTHETIC
SYSTOX AND ISOSYSTOX MIXTURE	=	DEMETON
2,4,5-T	=	2,4,5-TRICHLOROPHENOXYACETIC ACID
TALL OIL	=	OILS TALL
TALLOW	=	TALLOW
TALLOW FATTY ALCOHOL	=	TALLOW FATTY ALCOHOL
TALLOW OIL	=	TALLOW
TANNERS OIL	=	OIL, TANNERS
TANNIC ACID	=	TANNIC ACID
TANNIN	=	TANNIC ACID
TAR ACIDS	=	CRESOLS
TAR CAMPHOR	=	NAPHTHALENE, MOLTEN
TARTAR EMETIC	=	ANTIMONY POTASSIUM TARTRATE
L-TARTARIC ACID, AMMONIUM SALT	=	AMMONIUM TARTRATE
TARTARIZED ANTIMONY	=	ANTIMONY POTASSIUM TARTRATE
TARTRATED ANTIMONY	=	ANTIMONY POTASSIUM TARTRATE
TBA	=	TERT-BUTYLAMINE
TCP	=	TRICRESYL PHOSPHATE
TCP	=	CALCIUM PHOSPHATE
TDE	=	DDD
TDI	=	TOLUENE 2,4-DIISOCYANATE (TDI)
TEA	=	TRIETHYLALUMINUM
TEAR GAS	=	CHLOROACETOPHENONE
TEFLON MONOMER	=	TETRAFLUOROETHYLENE, INHIBITED
TEG	=	TRIETHYLENE GLYCOL
TEL	=	TETRAETHYL LEAD
TELONE	=	DICHLOROPROPENE
TEN	=	TRIETHYLAMINE

SYNONYM		COMPOUND NAME
TEP	=	TETRAETHYL PYROPHOSPHATE
TEPP	=	TETRAETHYL PYROPHOSPHATE
TEREPHTHALIC ACID, DIMETHYL ESTER	=	DIMETHYL TEREPHTHALATE
TERGITOL 3-A-6 NONIONIC	=	ETHOXYLATED TRIDECANOL
TERGITOL NONIONIC 45-S-10	=	ETHOXYLATED PENTADECANOL
TERGITOL NONIONIC 45-S-10	=	ETHOXYLATED TETRADECANOL
TERGITOL NONIONIC TMN	=	ETHOXYLATED DODECANOL
TERPINENE	=	DIPENTENE
DELTA-1,8-TERPODIENE	=	DIPENTENE
TERTIARY BUTYL ALCOHOL	=	TERT-BUTYL ALCOHOL
TERTIARY BUTYL HYDROPEROXIDE	=	TERT-BUTYL HYDROPEROXIDE
2,4,5-T(ESTERS)	=	2,4,5-T(ESTERS)
TETA	=	TRIETHYLENETETRAMINE
TETRABUTYL TITANATE	=	TETRABUTYL TITANATE
1,1,2,2-TETRACHLOROETHANE	=	TETRACHLOROETHANE
TETRACHLOROETHANE	=	TETRACHLOROETHANE
TETRACHLOROETHYLENE	=	TETRACHLOROETHYLENE
TETRACHLOROMETHANE	=	CARBON TETRACHLORIDE
1-TETRADECANOL	=	TETRADECANOL
TETRADECANOL	=	TETRADECANOL
TETRADECANOL	=	LINEAR ALCOHOLS (12-15 CARBONS)
1-TETRADECENE	=	1-TETRADECENE
N-TETRADECYL ALCOHOL	=	TETRADECANOL
TETRADECYLBENZENE	=	TETRADECYLBENZENE
TETRADECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
TETRAETHYL DITHIONOPYROPHOSPHATE	=	TETRAETHYL DITHIOPYROPHOSPHATE
TETRAETHYL DITHIOPYROPHOSPHATE	=	TETRAETHYL DITHIOPYROPHOSPHATE
TETRAETHYL LEAD	=	TETRAETHYL LEAD
TETRAETHYL ORTHOSILICATE	=	ETHYL SILICATE
TETRAETHYL PYROPHOSPHATE	=	TETRAETHYL PYROPHOSPHATE
O,O,O,O-TETRAETHYL PYROPHOSPHORODITHIONATE	=	TETRAETHYL DITHIOPYROPHOSPHATE
TETRAETHYLENE GLYCOL	=	TETRAETHYLENE GLYCOL
TETRAETHYLENEPENTAMINE	=	TETRAETHYLENEPENTAMINE
TETRAETHYL SILICATE	=	ETHYL SILICATE
TETRAFLUOROETHYLENE, INHIBITED	=	TETRAFLUOROETHYLENE, INHIBITED
TETRAHYDROFURAN	=	TETRAHYDROFURAN
3A,4,7,7A-TETRAHYDRO-4,7-METHANOINDENE	=	DICYCLOPENTADIENE
1,2,3,4-TETRAHYDRONAPHTHALENE	=	TETRAHYDRONAPHTHALENE
TETRAHYDRONAPHTHALENE	=	TETRAHYDRONAPHTHALENE
TETRAHYDRO-P-OXAZINE	=	MORPHOLINE
TETRAHYDRO-2H-1,4-OXAZINE	=	MORPHOLINE
TETRAHYDROTHIOPHENE-1,1-DIOXIDE	=	SULFOLANE
TETRAHYDROXYMETHYLMETHANE	=	PENTAERYTHRITOL
TETRALIN	=	TETRAHYDRONAPHTHALENE
TETRAMETHYLENEGLYCOL	=	1,4-BUTANEDIOL
TETRAMETHYLENE OXIDE	=	TETRAHYDROFURAN
TETRAMETHYLENE SULFONE	=	SULFOLANE
TETRAMETHYL LEAD	=	TETRAMETHYL LEAD
TETRAMETHYLOLMETHANE	=	PENTAERYTHRITOL
TETRAMETHYLTHIURAM DISULFIDE	=	THIRAM
TETRANAP	=	TETRAHYDRONAPHTHALENE
TETRAPROPYLENE	=	PROPYLENE TETRAMER
TETRAPROPYLENE	=	DODECENE
TETRINE ACID	=	ETHYLENEDIAMINE TETRACETIC ACID
TETRON	=	TETRAETHYL PYROPHOSPHATE
THANOL PPG	=	POLYPROPYLENE GLYCOL
THF	=	TETRAHYDROFURAN
2-THIAPROPANE	=	DIMETHYL SULFIDE
THIOBUTYL ALCOHOL	=	N-BUTYL MERCAPTAN
THIOCARBONYL CHLORIDE	=	THIOPHOSGENE
THIOCYANIC ACID, AMMONIUM SALT	=	AMMONIUM THIOCYANATE
THIOETHYL ALCOHOL	=	ETHYL MERCAPTAN
THIOMETHYL ALCOHOL	=	METHYL MERCAPTAN
THIOPHOSGENE	=	THIOPHOSGENE
THIOPHOSPHORIC ANHYDRIDE	=	PHOSPHORUS PENTASULFIDE

SYNONYM		COMPOUND NAME
THIRAM	=	THIRAM
THIURAM	=	THIRAM
THORIUM NITRATE	=	THORIUM NITRATE
THORIUM NITRATE TETRAHYDRATE	=	THORIUM NITRATE
THRETHYLENE	=	TRICHLOROETHYLENE
TIBA	=	TRIISOBUTYLALUMINUM
TIBAL	=	TRIISOBUTYLALUMINUM
TITANIUM BUTOXIDE	=	TETRABUTYL TITANATE
TITANIUM TETRABUTOXIDE	=	TETRABUTYL TITANATE
TITANIUM TETRACHLORIDE	=	TITANIUM TETRACHLORIDE
TOLUENE	=	TOLUENE
2,4-TOLUENE DIISOCYANATE	=	TOLUENE 2,4-DIISOCYANATE (TDI)
TOLUENE 2,4-DIISOCYANATE (TDI)	=	TOLUENE 2,4-DIISOCYANATE (TDI)
TOLUENE, MIXTURE WITH BENZENE AND XYLENES	=	NAPHTHA COAL TAR
P-TOLUENESULFONIC ACID	=	P-TOLUENESULFONIC ACID
O-TOLUIDINE	=	O-TOLUIDINE
TOLUOL	=	TOLUENE
M-TOLYLENE DIISOCYANATE	=	TOLUENE 2,4-DIISOCYANATE (TDI)
2,4-TOLYLENE DIISOCYANATE	=	TOLUENE 2,4-DIISOCYANATE (TDI)
TOLYL EPOXYPROPYL ETHER	=	CRESYL GLYCIDYL ETHER
TOLYL GLYCIDYL ETHER	=	CRESYL GLYCIDYL ETHER
TOSIC ACID	=	P-TOLUENESULFONIC ACID
TOXAPHENE	=	TOXAPHENE
TOXICHLOR	=	CHLORDANE
TOXILIC ACID	=	MALEIC ACID
TOXILIC ANHYDRIDE	=	MALEIC ANHYDRIDE
TRANSFORMER OIL	=	OIL: TRANSFORMER
TRANSMISSION OIL	=	OIL: MOTOR
TRANSMISSION OIL	=	OIL: LUBRICATING
TREFLAN	=	TRIFLURALIN
TRETHYLENE	=	TRICHLOROETHYLENE
TRI	=	TRICHLOROETHYLENE
TRI-6	=	BENZENE HEXACHLORIDE
TRICALCIUM ARSENATE	=	CALCIUM ARSENATE
TRICALCIUM ORTHOARSENATE	=	CALCIUM ARSENATE
TRICHLORAN	=	TRICHLOROETHYLENE
TRICHLOROAMYLSILANE	=	N-AMYLTRICHLOROSILANE
1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE	=	DDT
1,1,1-TRICHLOROETHANE	=	TRICHLOROETHANE
TRICHLOROETHANE	=	TRICHLOROETHANE
TRICHLOROETHENE	=	TRICHLOROETHYLENE
TRICHLOROETHYLENE	=	TRICHLOROETHYLENE
TRICHLOROETHYLSILANE	=	ETHYLTRICHLOROSILANE
TRICHLOROETHYLSILICANE	=	ETHYLTRICHLOROSILANE
TRICHLOROFLUOROMETHANE	=	TRICHLOROFLUOROMETHANE
TRICHLOROIMINOISOCYANURIC ACID	=	TRICHLORO-S-TRIAZINETRIONE
TRICHLOROISOCYANURIC ACID	=	TRICHLORO-S-TRIAZINETRIONE
TRICHLOROMETHANE	=	CHLOROFORM
TRICHLOROMETHANE	=	CALCIUM FLUORIDE
TRICHLOROMETHANE SULPHURYL CHLORIDE	=	PERCHLOROMETHYL MERCAPTAN
TRICHLOROMETHANESULFENYL CHLORIDE	=	PERCHLOROMETHYL MERCAPTAN
TRICHLOROMETHYL SULPHOCHLORIDE	=	PERCHLOROMETHYL MERCAPTAN
TRICHLOROMETHYLSILANE	=	METHYLTRICHLOROSILANE
TRICHLOROMETHYLSULFUR CHLORIDE	=	PERCHLOROMETHYL MERCAPTAN
N-TRICHLOROMETHYLTHIO-CIS-CYCLOHEXENE-1,2-DICARBOXIMIDE	=	CAPTAN
N-((TRICHLOROMETHYL)THIO)-4-CYCLOHEXENE-1,2-DICARBOXIMIDE	=	CAPTAN
N-TRICHLOROMETHYLTHIO-CIS-(DELTA 4)CYCLOHEXENE-1,2-DICARBOXIMIDE	=	CAPTAN
TRICHLOROMONOSILANE	=	TRICHLOROSILANE
TRICHLORONITROMETHANE	=	CHLOROPICRIN, LIQUID
TRICHLOROOXO VANADIUM	=	VANADIUM OXYTRICHLORIDE

SYNONYM		COMPOUND NAME
TRICHLOROPENTYLSILANE	=	N-AMYLTRICHLOROSILANE
TRICHLOROPHENOL	=	TRICHLOROPHENOL
2,4,5-TRICHLOROPHENOL	=	TRICHLOROPHENOL
2,4,5-TRICHLOROPHENOXYACETIC ACID	=	2,4,5-TRICHLOROPHENOXYACETIC ACID
TRICHLOROSILANE	=	TRICHLOROSILANE
TRICHLORO-S-TRIAZINETRIONE	=	TRICHLORO-S-TRIAZINETRIONE
TRICHLOROTRIAZINETRIONE	=	TRICHLORO-S-TRIAZINETRIONE
TRICHLORO-S-TRIAZINE-2,4,6-(1H,3H,5H)-TRIONE	=	TRICHLORO-S-TRIAZINETRIONE
1,3,5-TRICHLORO-2,4,6-TRIOXO-1,3,5-TRIAZINE	=	TRICHLORO-S-TRIAZINETRIONE
TRICHLOROVINYL SILICANE	=	VINYLTRICHLOROSILANE
TRICHLOROVINYLSILANE	=	VINYLTRICHLOROSILANE
TRICLENE	=	TRICHLOROETHYLENE
TRI-CLENE	=	TRICHLOROETHYLENE
TRICRESYL PHOSPHATE	=	TRICRESYL PHOSPHATE
TRI-P-CRESYL PHOSPHATE	=	TRICRESYL PHOSPHATE
1-TRIDECANOL	=	TRIDECANOL
TRIDECANOL	=	TRIDECANOL
TRIDECANOL	=	LINEAR ALCOHOLS (12-15 CARBONS)
1-TRIDECENE	=	1-TRIDECENE
TRIDECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
TRIELENE	=	TRICHLOROETHYLENE
TRIEN	=	TRIETHYLENETETRAMINE
TRIETHANOLAMINE	=	TRIETHANOLAMINE
TRIETHANOLAMINE CODECYLBENZENESULFONATE	=	CODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT
TRIETHANOLAMINE LAURYL SULFATE	=	CODECYL SULFATE, TRIETHANOLAMINE SALT
TRIETHYLALUMINUM	=	TRIETHYLALUMINUM
TRIETHYLAMINE	=	TRIETHYLAMINE
TRIETHYLBENZENE	=	TRIETHYLBENZENE
SYM-TRIETHYLBENZENE	=	TRIETHYLBENZENE
1,3,5-TRIETHYLBENZENE	=	TRIETHYLBENZENE
TRIETHYLENE GLYCOL	=	TRIETHYLENE GLYCOL
TRIETHYLENE GLYCOL MONOETHYL ETHER	=	ETHOXY TRIGLYCOL
TRIETHYLENEPHOSPHORAMIDE	=	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
TRIETHYLENETETRAMINE	=	TRIETHYLENETETRAMINE
TRIETHYLOLAMINE	=	TRIETHANOLAMINE
ALPHA,ALPHA,ALPHA-TRIFLUORO-2,6-DINITRO-N,N-DIPROPYL-P-TOLUIDINE	=	TRIFLURALIN
TRIFLUOROCHLOROETHYLENE	=	TRIFLUOROCHLOROETHYLENE
TRIFLUOROMONOCHLOROETHYLENE	=	TRIFLUOROCHLOROETHYLENE
TRIFLUOROVINYL CHLORIDE	=	TRIFLUOROCHLOROETHYLENE
TRIFLURALIN	=	TRIFLURALIN
TRIGLYCINE	=	NITRILOTRIACETIC ACID AND SALTS
TRIGLYCOL	=	TRIETHYLENE GLYCOL
TRIGLYCOL MONOETHYL ETHER	=	ETHOXY TRIGLYCOL
1,2,3-TRIHYDROXYBENZENE	=	PYROGALLIC ACID
3,4,5-TRIHYDROXYBENZOIC ACID	=	GALLIC ACID
1,2,3-TRIHYDROXYPROPANE	=	GLYCERINE
TRIHYDROXYTRIETHYLAMINE	=	TRIETHANOLAMINE
TRIISOBUTYLALUMINUM	=	TRIISOBUTYLALUMINUM
TRILENE	=	TRICHLOROETHYLENE
TRILINE	=	TRICHLOROETHYLENE
TRIMAR	=	TRICHLOROETHYLENE
TRIMETHYLAMINE	=	TRIMETHYLAMINE
TRIMETHYLAMINOMETHANE	=	TERT-BUTYLAMINE
TRIMETHYLBENZYLAMMONIUM CHLORIDE	=	BENZYLTRIMETHYLAMMONIUM CHLORIDE
3,7,7-TRIMETHYLBICYCLO(0.1.4)HEPT-3-ENE	=	CARENE
TRIMETHYLCARBINOL	=	TERT-BUTYL ALCOHOL
TRIMETHYLCHLOROSILANE	=	TRIMETHYLCHLOROSILANE
3,5,5-TRIMETHYL-2-CYCLOHENE-1-ONE	=	ISOPHORONE
TRIMETHYLENE	=	CYCLOPROPANE
TRIMETHYLHEPTANALS	=	ISODECALDEHYDE
4,7,7-TRIMETHYL-3-NORCARENE	=	CARENE

SYNONYM		COMPOUND NAME
2,4,4-TRIMETHYL-1-PENTENE	=	DIISOBUTYLENE
TRIMETHYLSILYL CHLORIDE	=	TRIMETHYLCHLOROSILANE
3,6,9-TRIOXAUNDECAN-1,11-DIOL	=	TETRAETHYLENE GLYCOL
TRIPROPYLENE	=	NONENE
TRIPROPYLENE GLYCOL	=	TRIPROPYLENE GLYCOL
TRIS(AZIRIDINYL)PHOSPHINE OXIDE	=	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
TRIS (HYDROXYETHYL)AMINE	=	TRIETHANOLAMINE
TRISODIUM NITRILOTRIACETATE	=	NITRILOTRIACETIC ACID AND SALTS
TRI-P-TOLYL PHOSPHATE	=	TRICRESYL PHOSPHATE
P-TSA	=	P-TOLUENESULFONIC ACID
TURPENTINE	=	TURPENTINE
TURPS	=	TURPENTINE
TYRANTON	=	DI ETONE ALCOHOL
UCANE ALKYLATE 12	=	DO CYLBENZENE
UCAR BISPHENOL HP	=	BISPHENOL A
UCON 11	=	TRICHLOROFLUOROMETHANE
UCON 12	=	DICHLORODIFLUOROMETHANE
UCON 22	=	MONOCHLORODIFLUOROMETHANE
UDMH	=	1,1-DIMETHYLHYDRAZINE
UNDECANOL	=	UNDECANOL
1-UNDECANOL	=	UNDECANOL
1-UNDECENE	=	1-UNDECENE
UNDECYL ALCOHOL	=	UNDECANOL
N-UNDECYLBENZENE	=	N-UNDECYLBENZENE
UNDECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
UNDECYLETHYLENE	=	1-TRIDECENE
UNDECYLIC ALCOHOL	=	UNDECANOL
UNSLAKED LIME	=	CALCIUM OXIDE
URANIUM ACETATE	=	URANYL ACETATE
URANIUM ACETATE DIHYDRATE	=	URANYL ACETATE
URANIUM NITRATE	=	URANYL NITRATE
URANIUM OXYACETATE DIHYDRATE	=	URANYL ACETATE
URANIUM SULFATE	=	URANYL SULFATE
URANIUM SULFATE TRIHYDRATE	=	URANYL SULFATE
URANYL ACETATE	=	URANYL ACETATE
URANYL ACETATE DIHYDRATE	=	URANYL ACETATE
URANYL NITRATE	=	URANYL NITRATE
URANYL SULFATE	=	URANYL SULFATE
URANYL SULFATE TRIHYDRATE	=	URANYL SULFATE
UREA	=	UREA
UREA HYDROGEN PEROXIDE	=	UREA PEROXIDE
UREA PEROXIDE	=	UREA PEROXIDE
URITONE	=	HEXAMETHYLENETETRAMINE
UROTROPIN	=	HEXAMETHYLENETETRAMINE
VALENTINITE	=	ANTIMONY TRIOXIDE
VALERAL	=	VALERALDEHYDE
VALERALDEHYDE	=	VALERALDEHYDE
VALERIC ALDEHYDE	=	VALERALDEHYDE
VAM	=	VINYL ACETATE
VANADIC ANHYDRIDE	=	VANADIUM PENTOXIDE
VANADIUM OXYSULFATE	=	VANADYL SULFATE
VANADIUM OXYTRICHLORIDE	=	VANADIUM OXYTRICHLORIDE
VANADIUM PENTAOXIDE	=	VANADIUM PENTOXIDE
VANADIUM PENTOXIDE	=	VANADIUM PENTOXIDE
VANADYL CHLORIDE	=	VANADIUM OXYTRICHLORIDE
VANADYL SULFATE	=	VANADYL SULFATE
VANADYL SULFATE DIHYDRATE	=	VANADYL SULFATE
VANADYL TRICHLORIDE	=	VANADIUM OXYTRICHLORIDE
VANICIDE	=	CAPTAN
VAPOTONE	=	TETRAETHYL PYROPHOSPHATE
VASELINE	=	PETROLATUM
VC	=	VINYL CHLORIDE
VCL	=	VINYL CHLORIDE
VCM	=	VINYL CHLORIDE
VEGETABLE CARBON	=	CHARCOAL

SYNONYM		COMPOUND NAME
VEGETABLE CHARCOAL	=	CHARCOAL
VEGETABLE OIL	=	OIL: VEGETABLE
VELSICOL	=	HEPTACHLOR
VELSICOL 1068	=	CHLORDANE
VENTOX	=	ACRYLONITRILE
VERSENE ACID	=	ETHYLENEDIAMINE TETRACETIC ACID
VIC-M-XYLENOL	=	XYLENOL
VIENNA GREEN	=	COPPER ACETOARSENITE
VILRATHANE 4300	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
VINEGAR ACID	=	ACETIC ACID
VINYL ACETATE	=	VINYL ACETATE
VINYL A MONOMER	=	VINYL ACETATE
VINYLBENZENE	=	STYRENE
VINYLCARBINOL	=	ALLYL ALCOHOL
VINYL CHLORIDE	=	VINYL CHLORIDE
VINYL C MONOMER	=	VINYL CHLORIDE
VINYL CYANIDE	=	ACRYLONITRILE
VINYLETHYLENE	=	BUTADIENE, INHIBITED
VINYL FLUORIDE, INHIBITED	=	VINYL FLUORIDE, INHIBITED
VINYLIDENECHLORIDE, INHIBITED	=	VINYLIDENECHLORIDE, INHIBITED
VINYL METHYL ETHER, INHIBITED	=	VINYL METHYL ETHER, INHIBITED
VINYLSILICON TRICHLORIDE	=	VINYLTRICHLOROSILANE
VINYLTOLUENE	=	VINYLTOLUENE
VINYLTRICHLOROSILANE	=	VINYLTRICHLOROSILANE
VYAC	=	VINYL ACETATE
WATER DISPLACING OIL	=	OIL: PENETRATING
WATER GLASS	=	SODIUM SILICATE
WAXES: CARNAUBA	=	WAXES: CARNAUBA
WAXES: PARAFFIN	=	WAXES: PARAFFIN
WEISSPIESSGLANZ	=	ANTIMONY TRIOXIDE
WHITE ARSENIC	=	ARSENIC TRIOXIDE
WHITE OIL	=	OIL: MINERAL
WHITE VITRIOL	=	ZINC SULFATE
WITCIZER 300	=	DIBUTYL PHTHALATE
WITCIZER 312	=	DIOCTYL PHTHALATE
WOOD ALCOHOL	=	METHYL ALCOHOL
WOOD CHARCOAL	=	CHARCOAL
WOOD ETHER	=	DIMETHYL ETHER
WOOD NAPHTHA	=	METHYL ALCOHOL
WOOD SPIRIT	=	METHYL ALCOHOL
WOOD TURPENTINE	=	TURPENTINE
META-XYLENE	=	M-XYLENE
P-XYLENE	=	P-XYLENE
O-XYLENE	=	O-XYLENE
M-XYLENE	=	P-XYLENE
XYLENES, MIXTURE WITH BENZENE AND TOLUENE	=	NAPHTHA COAL TAR
XYLENOL	=	XYLENOL
2,6-XYLENOL	=	XYLENOL
XYLOL	=	M-XYLENE
YELLOW ARSENIC SULFIDE	=	ARSENIC TRISULFIDE
YELLOW PETROLATUM	=	PETROLATUM
YELLOW PHOSPHORUS	=	PHOSPHORUS, WHITE
ZINC ACETATE	=	ZINC ACETATE
ZINC ACETATE DIHYDRATE	=	ZINC ACETATE
ZINC AMMONIUM CHLORIDE	=	ZINC AMMONIUM CHLORIDE
ZINC ARSENATE	=	ZINC ARSENATE
ZINC BORATE	=	ZINC BORATE
ZINC BROMIDE	=	ZINC BROMIDE
ZINC O,O-DI-N-BUTYLPHOSPHORODITHIOATE	=	ZINC DIALKYLDITHIOPHOSPHATE
ZINC CHLORIDE	=	ZINC CHLORIDE
ZINC CHROMATE	=	ZINC CHROMATE
ZINC CHROMATE(VI)HYDROXIDE	=	ZINC CHROMATE
ZINC DIACETATE	=	ZINC ACETATE
ZINC DIALKYLDITHIOPHOSPHATE	=	ZINC DIALKYLDITHIOPHOSPHATE

SYNONYM		COMPOUND NAME
ZINC DIETHYL	=	DIETHYLZINC
ZINC DIHEXYLDITHIOPHOSPHATE	=	ZINC DIALKYLDITHIOPHOSPHATE
ZINC DIHEXYLPHOSPHORODITHIOATE	=	ZINC DIALKYLDITHIOPHOSPHATE
ZINC DIMETHYL	=	DIMETHYLZINC
ZINC ETHYL	=	DIETHYLZINC
ZINC FLUOBORATE SOLUTION	=	ZINC FLUOROBORATE
ZINC FLUOROBORATE	=	ZINC FLUOROBORATE
ZINC FLUOSILICATE	=	ZINC SILICOFLUORIDE
ZINC HEXAFLUOROSILICATE	=	ZINC SILICOFLUORIDE
ZINC METHYL	=	DIMETHYLZINC
ZINC NITRATE	=	ZINC NITRATE
ZINC NITRATE HEXAHYDRATE	=	ZINC NITRATE
ZINC P-PHENOLSULFONATE	=	ZINC PHENOLSULFONATE
ZINC PHENOLSULFONATE	=	ZINC PHENOLSULFONATE
ZINC PHENOLSULFONATE OCTAHYDRATE	=	ZINC PHENOLSULFONATE
ZINC PHOSPHIDE	=	ZINC PHOSPHIDE
ZINC SILICOFLUORIDE	=	ZINC SILICOFLUORIDE
ZINC SILICOFLUORIDE HEXAHYDRATE	=	ZINC SILICOFLUORIDE
ZINC SULFATE	=	ZINC SULFATE
ZINC SULFATE HEPTAHYDRATE	=	ZINC SULFATE
ZINC SULFOCARBOLATE	=	ZINC PHENOLSULFONATE
ZINC SULFOPHENATE	=	ZINC PHENOLSULFONATE
ZINC VITRIOL	=	ZINC SULFATE
ZINC YELLOW	=	ZINC CHROMATE
ZIRCONIUM ACETATE	=	ZIRCONIUM ACETATE
ZIRCONIUM ACETATE SOLUTION	=	ZIRCONIUM ACETATE
ZIRCONIUM NITRATE	=	ZIRCONIUM NITRATE
ZIRCONIUM NITRATE PENTAHYDRATE	=	ZIRCONIUM NITRATE
ZIRCONIUM OXIDE CHLORIDE	=	ZIRCONIUM OXYCHLORIDE
ZIRCONIUM OXYCHLORIDE	=	ZIRCONIUM OXYCHLORIDE
ZIRCONIUM OXYCHLORIDE HYDRATE	=	ZIRCONIUM OXYCHLORIDE
ZIRCONIUM SULFATE	=	ZIRCONIUM SULFATE
ZIRCONIUM SULFATE TETRAHYDRATE	=	ZIRCONIUM SULFATE
ZIRCONYL CHLORIDE	=	ZIRCONIUM OXYCHLORIDE

INDEX OF CODES

AAC	ACETIC ACID
AAD	ACETALDEHYDE
AAM	ACRYLAMIDE
AAN	n-AMYL ALCOHOL
AAT	AMMONIUM ACETATE
ABC	AMMONIUM BICARBONATE
ABF	AMMONIUM BIFLUORIDE
ABM	ACETYL BROMIDE
ABR	ALLYL BROMIDE
ABS	ALKYLBENZENESULFONIC ACIDS
ABZ	AMMONIUM BENZOATE
ACA	ACETIC ANHYDRIDE
ACB	AMMONIUM CARBONATE
ACC	ACETYL CHLORIDE
ACD	ACRIDINE
ACE	ACETYLENE
ACF	ALLYL CHLOROFORMATE
ACI	AMMONIUM CITRATE
ACL	ALUMINUM CHLORIDE
ACN	ACRYLONITRILE
ACP	ACETOPHENONE
ACR	ACRYLIC ACID
ACT	ACETONE
ACY	ACETONE CYANOHYDRIN
ADA	ADIPIC ACID
ADN	ADIPONITRILE
AEA	AMINOETHANOLAMINE
AFM	AMMONIUM FORMATE
AFR	AMMONIUM FLUORIDE
AGC	AMMONIUM GLUCONATE
AID	AMMONIUM IODIDE
ALA	ALLYL ALCOHOL
ALC	ALLYL CHLORIDE
ALD	ALDRIN
ALF	ALUMINUM FLUORIDE
ALM	ALUMINUM SULFATE
ALN	ALUMINUM NITRATE
ALS	AMMONIUM LAURYL SULFATE
ALT	AMMONIUM LACTATE
AMA	AMMONIA, ANHYDROUS
AMB	AMMONIUM MOLYBDATE
AMC	AMMONIUM CHLORIDE
AMD	AMMONIUM DICHROMATE
AMF	AMMONIUM SULFITE
AMH	AMMONIUM HYDROXIDE (<28% AQUEOUS AMMONIA)
AMK	n-AMYL METHYL KETONE
AML	AMYL ACETATE
AMM	n-AMYL MERCAPTAN
AMN	AMMONIUM NITRATE
AMP	AMMONIUM PERCHLORATE
AMR	AMMONIUM STEARATE
AMS	AMMONIUM SULFATE
AMT	AMMONIUM THIOCYANATE
AMY	n-AMYL CHLORIDE
ANI	iso-AMYL NITRITE
ANL	ANILINE
ANP	AMMONIUM NITRATE - PHOSPHATE MIXTURE
ANS	AMMONIUM NITRATE - SULFATE MIXTURE
ANT	n-AMYL NITRATE
ANU	AMMONIUM NITRATE--UREA SOLUTION
AOL	AMMONIUM OLEATE
AOX	AMMONIUM OXALATE
APB	AMMONIUM PENTABORATE
APC	ANTIMONY PENTACHLORIDE
APE	AMMONIUM PERSULFATE
APF	ANTIMONY PENTAFLUORIDE
APP	AMMONIUM PHOSPHATE
APS	ACETYL PEROXIDE SOLUTION
APT	ANTIMONY POTASSIUM TARTRATE

INDEX OF CODES (Continued)

ARD	ARSENIC DISULFIDE
ARF	ASPHALT BLENDING STOCKS: ROOFERS FLUX
ARL	ACROLEIN
ART	ARSENIC TRISULFIDE
ASA	ARSENIC ACID
ASC	ANISOYL CHLORIDE
ASF	AMMONIUM SULFIDE
ASL	AMMONIUM SILICOFLUORIDE
ASM	AMMONIUM SULFAMATE
ASP	ASPHALT
ASR	ASPHALT BLENDING STOCKS: STRAIGHT RUN RESIDUE
AST	ARSENIC TRICHLORIDE
ATA	ACETYLACETONE
ATC	ALLYLTRICHLOROSILANE
ATF	AMMONIUM THIOSULFATE
ATH	ANTHRACENE
ATM	ANTIMONY TRICHLORIDE
ATN	ACETONITRILE
ATO	ARSENIC TRIOXIDE
ATR	AMMONIUM TARTRATE
ATS	n-AMYLTRICHLOROSILANE
ATT	ANTIMONY TRIFLUORIDE
ATX	ANTIMONY TRIOXIDE
ATZ	ATRAZINE
AZM	AZINPHOSMETHYL
BAC	BORIC ACID
BAD	iso-BUTYRALDEHYDE
BAI	iso-BUTYL ACRYLATE
BAL	BENZYL ALCOHOL
BAM	n-BUTYLAMINE
BAN	n-BUTYL ALCOHOL
BAS	sec-BUTYL ALCOHOL
BAT	tert-BUTYL ALCOHOL
BBP	BENZYL n-BUTYL PHTHALATE
BBR	BENZYL BROMIDE
BBZ	BROMOBENZENE
BCF	BENZYL CHLOROFORMATE
BCL	BENZYL CHLORIDE
BCN	n-BUTYL ACETATE
BCP	BOILER COMPOUND, LIQUID
BCR	BARIUM CHLORATE
BCS	BUTYLTRICHLOROSILANE
BDE	BISPHENOL A DIGLYCIDYL ETHER
BDI	BUTADIENE, INHIBITED
BDO	1,4-BUTANEDIOL
BEC	BERYLLIUM CHLORIDE
BEF	BERYLLIUM FLUORIDE
BEM	BERYLLIUM, METALLIC
BEN	BERYLLIUM NITRATE
BEO	BERYLLIUM OXIDE
BES	BERYLLIUM SULFATE
BHC	BENZENE HEXACHLORIDE
BHP	tert-BUTYL HYDROPEROXIDE
BMA	BENZYLTRIMETHYLAMMONIUM CHLORIDE
BMN	n-BUTYL METHACRYLATE
BNT	BARIUM NITRATE
BNZ	BENZENE
BOC	BISMUTH OXYCHLORIDE
BPA	BISPHENOL A
BPC	BARIUM PERCHLORATE
BPD	BENZENE PHOSPHORUS DICHLORIDE
BPF	BROMINE PENTAFLUORIDE
BPM	BARIUM PERMANGANATE
BPO	BARIUM PEROXIDE
BPT	BENZENE PHOSPHORUS THIODICHLORIDE
BRA	n-BUTYRIC ACID
BRC	BARIUM CARBONATE
BRT	BORON TRICHLORIDE

INDEX OF CODES (Continued)

BRU	BRUCINE
BRX	BROMINE
BTA	sec-BUTYL ACETATE
BTB	BORON TRIBROMIDE
BTC	n-BUTYL ACRYLATE
BTD	1,4-BUTYNEDIOL
BTF	BROMINE TRIFLUORIDE
BTL	sec-BUTYLAMINE
BTM	n-BUTYL MERCAPTAN
BTN	BUTYLENE
BTO	BUTYLENE OXIDE
BTP	p-tert-BUTYLPHENOL
BTR	n-BUTYRALDEHYDE
BUA	tert-BUTYLAMINE
BUD	1,4-BUTENEDIOL
BUT	BUTANE
BZA	BENZOIC ACID
BZC	BENZOYL CHLORIDE
BZD	BENZALDEHYDE
BZM	BENZYLAMINE
BZN	BENZONITRILE
BZO	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
BZP	BENZOPHENONE
CAA	COPPER ACETOARSENITE
CAC	CHLOROACETYL CHLORIDE
CAF	CALCIUM FLUORIDE
CAH	CALCIUM HYDROXIDE
CAL	CALCIUM PHOSPHATE
CAM	CALCIUM, METALLIC
CAO	CALCIUM OXIDE
CAP	p-CHLOROANILINE
CAR	CARENE
CAT	CADMIUM ACETATE
CBA	COBALT ACETATE
CBB	CARBON BISULFIDE
CBC	COBALT CHLORIDE
CBN	4-CHLOROBUTYRONITRILE
CBO	CARBOLIC OIL
CBR	CYANOGEN BROMIDE
CBS	COBALT SULFATE
CBT	CARBON TETRACHLORIDE
CBY	CARBARYL
CCA	CALCIUM ARSENATE
CCB	CALCIUM CARBIDE
CCC	CALCIUM CHLORATE
CCH	CYCLOHEXANONE
CCL	CYANOGEN CHLORIDE
CCN	CALCIUM CYANIDE
CCP	CALCIUM PEROXIDE
CCR	CALCIUM CHROMATE
CCT	CREOSOTE, COAL TAR
CCY	COPPER CYANIDE
CDA	CACODYLIC ACID
CDC	CADMIUM CHLORIDE
CDN	CHLORDANE
CDO	CARBON DIOXIDE
CES	CUPRIETHYLENEDIAMINE SOLUTION
CFB	CADMIUM FLUOROBORATE
CGE	CRESYL GLYCIDYL ETHER
CHA	CYCLOHEXYLAMINE
CHC	CHARCOAL
CHD	CHLOROHYDRINS (CRUDE)
CHN	CYCLOHEXANOL
CHP	CYCLOHEXANONE PEROXIDE
CHT	CYCLOHEXENYLTRICHLOROSILANE
CHX	CYCLOHEXANE
CHY	CALCIUM HYPOCHLORITE

INDEX OF CODES (Continued)

CID	COPPER IODIDE
CIT	CITRIC ACID
CLC	CALCIUM CHLORIDE
CLD	COLLODION
CLS	CAPROLACTAM, SOLUTION
CLX	CHLORINE
CMA	CHROMIC ANHYDRIDE
CMB	CADMIUM BROMIDE
CMC	CHROMYL CHLORIDE
CME	CHLOROMETHYL METHYL ETHER
CMH	CUMENE HYDROPEROXIDE
CMN	CADMIUM NITRATE
CMO	CARBON MONOXIDE
CMP	p-CYMENE
CMS	CADMIUM SULFATE
CNI	COPPER NITRATE
CNN	COPPER NAPHTHENATE
CNT	CALCIUM NITRATE
COL	COPPER OXALATE
CON	COBALT NITRATE
COP	COPPER ACETATE
COU	COUMAPHOS
COX	CADMIUM OXIDE
CPA	COPPER ARSENITE
CPB	COPPER BROMIDE
CPC	COPPER CHLORIDE
CPF	COPPER FLUOROBORATE
CPH	CAMPHENE
CPL	CHLOROPICRIN, LIQUID
CPN	p-CHLOROPHENOL
CPO	CAMPHOR OIL
CPP	CALCIUM PHOSPHIDE
CPR	CYCLOPROPANE
CPS	CAUSTIC POTASH SOLUTION
CPT	CAPTAN
CRA	CHLOROACETOPHENONE
CRB	CHLOROBENZENE
CRE	CALCIUM RESINATE
CRF	CHLOROFORM
CRS	CRESOLS
CSA	CHLOROSULFONIC ACID
CSF	COPPER SULFATE
CSS	CAUSTIC SODA SOLUTION
CSY	CORN SYRUP
CTA	CROTONALDEHYDE
CTC	CATECHOL
CTD	4-CHLORO-o-TOLUIDINE
CTF	CHLORINE TRIFLUORIDE
CUM	CUMENE
CYA	CYANOACETIC ACID
CYG	CYANOGEN
CYP	CYCLOPENTANE
DAA	DIACETONE ALCOHOL
DAC	DIMETHYLACETAMIDE
DAI	DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT
DAL	DECALDEHYDE
DAM	DIPHENYLAMINE
DAN	n-DECYL ALCOHOL
DAP	DI-n-AMYL PHTHALATE
DBA	DI-n-BUTYLAMINE
DBC	DIISOBUTYLCARBINOL
DBE	DI-n-BUTYL ETHER
DBK	DI-n-BUTYL KETONE
DBL	DIISOBUTYLENE
DBO	o-DICHLOROBENZENE
DBP	p-DICHLOROBENZENE
DBR	DECABORANE
DBS	DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT

INDEX OF CODES (Continued)

DBT	DIBUTYLPHENOL
DBZ	n-DECYLBENZENE
DCA	2,4-DICHLOROPHENOXYACETIC ACID
DCB	DICHLOROBUTENE
DCE	1-DECENE
DCF	DICHLORODIFLUOROMETHANE
DCM	DICHLOROMETHANE
DCP	2,4-DICHLOROPHENOL
DCS	DODECYLBENZENESULFONIC ACID, CALCIUM SALT
DDB	DODECYLBENZENE
DDC	1-DODECENE
DDD	D D D
DDN	DODECANOL
DDS	DODECYL SULFATE, SODIUM SALT
DDT	DDT
DDW	DIMETHYLHEXANE DIHYDROPEROXIDE, WET
DEA	DIETHANOLAMINE
DEB	DIETHYLBENZENE
DEC	DIETHYL CARBONATE
DED	DIELDRIN
DEE	DICHLOROETHYL ETHER
DEG	DIETHYLENE GLYCOL
DEL	1,2-DICHLOROETHYLENE
DEM	DIETHYLENEGLYCOL MONOBUTYL ETHER ACETATE
DEN	DIETHYLAMINE
DEP	DI-(2-ETHYLHEXYL)PHOSPHORIC ACID
DES	2,4-D ESTERS
DET	DIETHYLENETRIAMINE
DEZ	DIETHYLZINC
DFA	DIFLUOROPHOSPHORIC ACID, ANHYDROUS
DFE	1,1-DIFLUOROETHANE
DFF	DISTILLATES: FLASHED FEED STOCKS
DGD	DIETHYLENE GLYCOL DIMETHYL ETHER
DGE	DIETHYLENE GLYCOL MONOETHYL ETHER
DGM	DIETHYLENE GLYCOL MONOMETHYL ETHER
DHN	DECAHYDRONAPHTHALENE
DHP	DIHEPTYL PHTHALATE
DIA	DIISOPROPYLAMINE
DID	DIISODECYL PHTHALATE
DIH	DIISOPROPYLBENZENE HYDROPEROXIDE
DIK	DIISOBUTYL KETONE
DIM	DIMETHYL ETHER
DIP	DIISOPROPANOLAMINE
DLP	DALAPON
DMA	DIMETHYLAMINE
DMD	DIMETHYLDICHLOROSILANE
DME	DIETHYLENEGLYCOL MONOBUTYL ETHER
DMF	DIMETHYLFORMAMIDE
DMH	1,1-DIMETHYLHYDRAZINE
DMP	DIMETHYLPOLYSILOXANE
DMS	DIMETHYL SULFOXIDE
DMT	DIMETHYL TEREPHTHALATE
DMZ	DIMETHYLZINC
DNA	DI-n-PROPYLAMINE
DNB	m-DINITROBENZENE
DNC	DINITROCRESOLS
DNP	2,4-DINITROPHENOL
DNT	2,4-DINITROANILINE
DOA	DIOCTYL ADIPATE
DOD	DODECENE
DOP	DIOCTYL PHTHALATE
DOX	1,4-DIOXANE
DPA	DIBUTYL PHTHALATE
DPD	DIPHENYLDICHLOROSILANE
DPE	DIPHENYL ETHER
DPG	DIPROPYLENE GLYCOL
DPH	DIETHYL PHTHALATE
DPM	DIPHENYLMETHANE DIISOCYANATE

INDEX OF CODES (Continued)

DPN	DIPENTENE
DPO	DIBENZOYL PEROXIDE
DPP	DICHLOROPROPANE
DPR	DICHLOROPROPENE
DPT	DICYCLOPENTADIENE
DSD	DODECYL SULFATE, DIETHANOLAMINE SALT
DSF	DIMETHYL SULFATE
DSL	DIMETHYL SULFIDE
DSM	DODECYL SULFATE, MAGNESIUM SALT
DSR	DISTILLATES: STRAIGHT RUN
DSS	DIOCTYL SODIUM SULFOSUCCINATE
DST	DODECYL SULFATE, TRIETHANOLAMINE SALT
DTC	DODECYLTRICHLOROSILANE
DTH	DOWTHERM
DTM	4,4'-DICHLORO-alpha-TRICHLOROMETHYL-BENZHYDROL
DTN	DEMETON
DTS	DEXTROSE SOLUTION
DTT	2,4-DINITROTOLUENE
DZN	DIAZINON
DZP	DI-(p-CHLOROBENZOYL) PEROXIDE
EAA	ETHYL ACETOACETATE
EAC	ETHYL ACRYLATE
EAD	ETHYLALUMINUM DICHLORIDE
EAI	2-ETHYLHEXYL ACRYLATE, INHIBITED
EAL	ETHYL ALCOHOL
EAM	ETHYLAMINE
EAS	ETHYLALUMINUM SESQUICHLORIDE
EBR	ETHYL BUTYRATE
EBT	ETHYL BUTANOL
ECA	ETHYL CHLOROACETATE
ECF	ETHYL CHLOROFORMATE
ECH	ETHYLENE CHLOROHYDRIN
ECL	ETHYL CHLORIDE
ECS	ETHYLDICHLOROSILANE
EDA	ETHYLENEDIAMINE
EDB	ETHYLENE BIBROMIDE
EDC	ETHYLENE DICHLORIDE
EDR	ENDRIN
EDT	ETHYLENEDIAMINE TETRACETIC ACID
EEE	ETHYLENE GLYCOL DIETHYL ETHER
EET	ETHYL ETHER
EFM	ETHYL FORMATE
EGA	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
EGD	ETHYLENE GLYCOL DIMETHYL ETHER
EGE	ETHYLENE GLYCOL MONOETHYL ETHER
EGL	ETHYLENE GLYCOL
EGM	ETHYLENE GLYCOL MONOBUTYL ETHER
EGY	ETHYLENE GLYCOL DIACETATE
EHA	ETHYLHEXALDEHYDE
EHP	ETHOXYDIHYDROPYRAN
EHT	ETHYL HEXYL TALLATE
EHX	2-ETHYL HEXANOL
ELT	ETHYL LACTATE
EMA	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
EMC	ETHYL MERCAPTAN
EME	ETHYLENE GLYCOL MONOMETHYL ETHER
ENB	ETHYLIDENENORBORNENE
ENP	ETHOXYLATED NONYLPHENOL
EOD	ETHOXYLATED DODECANOL
EOP	ETHOXYLATED PENTADECANOL
EOT	ETHOXYLATED TETRADECANOL
EOX	ETHYLENE OXIDE
EPA	2-ETHYL-3-PROPYLACROLEIN
EPC	EPICHLOROHYDRIN
EPD	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
EPP	ETHYL PHOSPHORODICHLORIDATE
EPS	ETHYLPHENYLDICHLOROSILANE

INDEX OF CODES (Continued)

ESC	ETHYL SILICATE
ETA	ETHYL ACETATE
ETB	ETHYLBENZENE
ETC	ETHYLENE CYANOHYDRIN
ETD	ETHOXYLATED TRIDECANOL
ETG	ETHOXY TRIGLYCOL
ETH	ETHANE
ETI	ETHYLENEIMINE
ETL	ETHYLENE
ETM	ETHYL METHACRYLATE
ETN	ETHYL NITRITE
ETS	ETHYLTRICHLOROSILANE
EVO	EPOXIDIZED VEGETABLE OILS
FAC	FERRIC AMMONIUM CITRATE
FAL	FURFURYL ALCOHOL
FAO	FERRIC AMMONIUM OXALATE
FAS	FERROUS AMMONIUM SULFATE
FCL	FERRIC CHLORIDE
FCP	FERRIC GLYCEROPHOSPHATE
FEC	FERROUS CHLORIDE
FFA	FURFURAL
FFB	FERROUS FLUOROBORATE
FMA	FORMIC ACID
FMS	FORMALDEHYDE SOLUTION
FNT	FERRIC NITRATE
FOX	FERROUS OXALATE
FRS	FERROUS SULFATE
FSA	FLUOSULFONIC ACID
FSF	FERRIC SULFATE
FSL	FLUOSILICIC ACID
FUM	FUMARIC ACID
FXX	FLUORINE
GAK	GASOLINE BLENDING STOCKS: ALKYLATES
GAT	GASOLINES: AUTOMOTIVE (<4.23g LEAD/GAL.)
GAV	GASOLINES: AVIATION (<4.86g LEAD/GAL.)
GCM	GLYCIDYL METHACRYLATE
GCR	GLYCERINE
GCS	GASOLINES: CASINGHEAD
GLA	GALLIC ACID
GOC	GAS OIL: CRACKED
GOS	GLYOXAL, 40% SOLUTION
GPL	GASOLINES: POLYMER
GRF	GASOLINE BLENDING STOCKS: REFORMATES
GSR	GASOLINES: STRAIGHT RUN
GTA	GLUTARALDEHYDE SOLUTION
HAC	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE
HAI	2-HYDROXYETHYL ACRYLATE, INHIBITED
HAL	n-HEXALDEHYDE
HAS	HYDROXYLAMINE SULFATE
HBR	HYDROGEN BROMIDE
HCC	HEXACHLOROCYLOPENTADIENE
HCL	HYDROCHLORIC ACID
HCN	HYDROGEN CYANIDE
HDC	HYDROGEN CHLORIDE
HDQ	HYDROQUINONE
HDS	HYDROGEN SULFIDE
HDZ	HYDRAZINE
HFA	HYDROFLUORIC ACID
HFX	HYDROGEN FLUORIDE
HMD	HEXAMETHYLENEDIAMINE
HMI	HEXAMETHYLENEIMINE
HMT	HEXAMETHYLENETETRAMINE
HPA	HYDROXYPROPYL ACRYLATE
HPM	HYDROXYPROPYL METHACRYLATE

INDEX OF CODES (Continued)

HPO	HYDROGEN PEROXIDE
HPT	HEPTANE
HSS	HEXADECYL SULFATE, SODIUM SALT
HTC	HEPTACHLOR
HTE	1-HEPTENE
HTN	HEPTANOL
HXA	HEXANE
HXE	1-HEXENE
HXG	HEXYLENE GLYCOL
HXN	HEXANOL
HXX	HYDROGEN, LIQUEFIED
IAA	ISOAMYL ALCOHOL
IAC	ISOPROPYL ACETATE
IAI	ISODECYL ACRYLATE, INHIBITED
IAL	ISOBUTYL ALCOHOL
IAM	ISOBUTYLAMINE
IBA	ISOBUTYL ACETATE
IBL	ISOBUTYLENE
IBN	ISOBUTYRONITRILE
IBR	ISOBUTYRIC ACID
IBT	ISOBUTANE
IDA	ISODECALDEHYDE
IHA	ISOHEXANE
IOA	ISOOCTYL ALCOHOL
IOC	ISOOCTALDEHYDE
IPA	ISOPROPYL ALCOHOL
IPC	ISOPROPYL PERCARBONATE
IPE	ISOPROPYL ETHER
IPH	ISOPHORONE
IPL	ISOPHTHALIC ACID
IPM	ISOPROPYL MERCAPTAN
IPP	ISOPROPYLAMINE
IPR	ISOPRENE
IPT	ISOPENTANE
ISA	ISODECYL ALCOHOL
IVA	ISOVALERALDEHYDE
JPF	JET FUELS: JP-4
JPO	JET FUELS: JP-1 (KEROSENE)
JPT	JET FUELS: JP-3
JPV	JET FUELS: JP-5 (KEROSENE, HEAVY)
KPS	KEROSENE
LAC	LEAD ACETATE
LAH	LITHIUM ALUMINUM HYDRIDE
LAL	LINEAR ALCOHOLS (12-15 CARBON)
LAR	LEAD ARSENATE
LFB	LEAD FLUOROBORATE
LFR	LEAD FLUORIDE
LHD	LITHIUM HYDRIDE
LID	LEAD IODIDE
LLS	LATEX, LIQUID SYNTHETIC
LNG	LIQUEFIED NATURAL GAS
LNT	LEAD NITRATE
LPG	LIQUEFIED PETROLEUM GAS
LPO	LAUROYL PEROXIDE
LRM	LAURYL MERCAPTAN
LTA	LACTIC ACID
LTC	LEAD THIOCYANATE
LTH	LITHARGE
LTM	LITHIUM, METALLIC
LTT	LEAD TETRAACETATE
MAA	METHYL AMYL ALCOHOL
MAC	METHYL AMYL ACETATE
MAL	METHYL ALCOHOL
MAM	METHYL ACRYLATE

INDEX OF CODES (Continued)

MAN	N-METHYLANILINE
MAP	METHYL ACETYLENE - PROPADIENE MIXTURE
MAT	MERCURIC ACETATE
MBK	METHYL n-BUTYL KETONE
MCA	MONOCHLOROACETIC ACID
MCC	MERCURIC AMMONIUM CHLORIDE
MCF	MONOCHLORODIFLUOROMETHANE
MCH	METHYL CHLOROFORMATE
MCL	METHALLYL CHLORIDE
MCN	MERCURIC CYANIDE
MCP	METHYLCYCLOPENTANE
MCR	MERCURY
MCS	METHYLDICHLOROSILANE
MCT	METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL
MEA	MONOETHANOLAMINE
MEK	METHYL ETHYL KETONE
MEP	METHYLETHYLPYRIDINE
MFA	MOTOR FUEL ANTI-KNOCK COMPOUNDS CONTAINING LEAD ALKYLS
MFM	METHYL FORMATE
MGX	MAGNESIUM
MHZ	METHYLHYDRAZINE
MIC	METHYL ISOBUTYL CARBINOL
MID	MERCURIC IODIDE
MIK	METHYL ISOBUTYL KETONE
MLA	MALEIC ANHYDRIDE
MLH	MALEIC HYDRAZIDE
MLI	MALEIC ACID
MLT	MALATHION
MMC	METHYL MERCAPTAN
MMM	METHYL METHACRYLATE
MNS	MINERAL SPIRITS
MNT	MERCURIC NITRATE
MOC	METHOXYCHLOR
MOX	MERCURIC OXIDE
MPA	MONOISOPROPANOLAMINE
MPC	MAGNESIUM PERCHLORATE
MPD	METHYL PHOSPHONOTHIOIC DICHLORIDE (ANHYD)
MPK	METHYL ISOPROPENYL KETONE, INHIBITED
MPL	MORPHOLINE
MPT	METHYL PARATHION
MPY	1-METHYLPYRROLIDONE
MRC	MERCURIC CHLORIDE
MRN	MERCUROUS NITRATE
MRR	MERCUROUS CHLORIDE
MSA	METHANEARSONIC ACID, SODIUM SALTS
MSF	MERCURIC SULFIDE
MSO	MESITYL OXIDE
MSR	alpha-METHYLSTYRENE
MTA	METHYLAMINE
MTB	METHYL BROMIDE
MTC	METHYL CHLORIDE
MTF	METHYL FORMAL
MTH	METHANE
MTO	MOLYBDIC TRIOXIDE
MTS	METHYLTRICHLOROSILANE
MTT	METHYL ACETATE
MVK	METHYL VINYL KETONE
NAA	NITRILOTRIACETIC ACID AND SALTS
NAB	NABAM
NAC	NITRIC ACID
NAL	4-NITROANILINE
NAN	NONANE
NAO	1-NAPHTHYLAMINE
NAS	NICKEL AMMONIUM SULFATE
NBR	NICKEL BROMIDE
NCL	NICKEL CHLORIDE

INDEX OF CODES (Continued)

NCN	NICKEL CYANIDE
NCS	NICOTINE SULFATE
NCT	NAPHTHA: COAL TAR
NFB	NICKEL FLUOROBORATE
NFM	NICKEL FORMATE
NHX	NEOHEXANE
NIC	NICOTINE
NKA	NICKEL ACETATE
NKC	NICKEL CARBONYL
NKS	NICKEL SULFATE
NMT	NITROMETHANE
NNE	1-NONENE
NNN	NONANOL
NNP	NONYLPHENOL
NNT	NICKEL NITRATE
NON	NONENE
NOX	NITROGEN TETROXIDE
NPH	4-NITROPHENOL
NPP	2-NITROPROPANE
NSS	NAPHTHA: STODDARD SOLVENT
NSV	NAPHTHA: SOLVENT
NTA	2-NITROANILINE
NTB	NITROBENZENE
NTC	NITROSYL CHLORIDE
NTE	NITROETHANE
NTI	NAPTHENIC ACIDS
NTL	NITRALIN
NTM	NAPHTHALENE, MOLTEN
NTO	NITROUS OXIDE
NTP	2-NITROPHENOL
NTX	NITRIC OXIDE
NVM	NAPHTHA: VM & P (75% NAPHTHA)
NXX	NITROGEN, LIQUEFIED
OAC	OLEIC ACID, SODIUM SALT
OAN	OCTANE
OAP	OLEIC ACID, POTASSIUM SALT
OAS	OILS, MISCELLANEOUS: ABSORPTION
OCA	OILS, EDIBLE: CASTOR
OCC	OILS, EDIBLE: COCONUT
OCF	OILS: CLARIFIED
OCR	OILS, MISCELLANEOUS: CROTON
OCS	OILS, EDIBLE: COTTONSEED
OCT	OILS, MISCELLANEOUS: COAL TAR
ODS	OILS: DIESEL
OET	OCTYL EPOXY TALLATE
OFR	OILS, FUEL: NO. 4
OFS	OILS, EDIBLE: FISH
OFV	OILS, FUEL: NO. 5
OIL	OILS: CRUDE
OLA	OLEIC ACID
OLB	OILS, MISCELLANEOUS: LUBRICATING
OLD	OILS, EDIBLE: LARD
OLM	OLEUM
OLS	OILS, MISCELLANEOUS: LINSEED
OMN	OILS, MISCELLANEOUS: MINERAL
OMS	OILS, MISCELLANEOUS: MINERAL SEAL
OMT	OILS, MISCELLANEOUS: MOTOR
ONF	OILS, MISCELLANEOUS: NEATSFOOT
OOD	OILS, FUEL: NO. 1-D
OOL	OILS, EDIBLE: OLIVE
OON	OILS, FUEL: NO. 1 (KEROSENE)
OPM	OILS, EDIBLE: PALM
OPN	OILS, EDIBLE: PEANUT
OPT	OILS, MISCELLANEOUS: PENETRATING
ORD	OILS, MISCELLANEOUS: ROAD
ORG	OILS, MISCELLANEOUS: RANGE

ORN	OILS, MISCELLANEOUS: ROSIN
ORS	OILS, MISCELLANEOUS: RESIN
OSB	OILS, EDIBLE: SOYA BEAN
OSD	OILS, MISCELLANEOUS: SPINDLE
OSF	OILS, EDIBLE: SAFFLOWER
OSP	OILS, MISCELLANEOUS: SPERM
OSX	OILS, FUEL: NO. 6
OSY	OILS, MISCELLANEOUS: SPRAY
OTA	OCTANOL
OTB	OILS, MISCELLANEOUS: TURBINE
OTC	OILS, EDIBLE: TUCUM
OTD	OILS, FUEL: NO. 2-D
OTE	1-OCTENE
OTF	OILS, MISCELLANEOUS: TRANSFORMER
OTL	OILS, MISCELLANEOUS: TALL
OTN	OILS, MISCELLANEOUS: TANNER'S
OTW	OILS, FUEL: NO. 2
OVG	OILS, EDIBLE: VEGETABLE
OXA	OXALIC ACID
OXY	OXYGEN, LIQUEFIED
PAA	PERACETIC ACID
PAC	PHOSPHORIC ACID
PAD	PROPIONALDEHYDE
PAH	PROPIONIC ANHYDRIDE
PAL	n-PROPYL ALCOHOL
PAN	PHTHALIC ANHYDRIDE
PAS	POTASSIUM ARSENATE
PAT	n-PROPYL ACETATE
PBO	POTASSIUM BINOXALATE
PBP	PROPYLENE BUTYLENE POLYMER
PBR	PHOSPHORUS TRIBROMIDE
PCB	POLYCHLORINATED BIPHENYL
PCH	POTASSIUM CHLOROMATE
PCL	PERCHLORIC ACID
PCM	PERCHLOROMETHYL MERCAPTAN
PCP	PENTACHLOROPHENOL
PCR	POTASSIUM CHLORATE
PDC	PENTADECANOL
PDL	PHENYLDICHLOROARSINE, LIQUID
PDT	POTASSIUM DICHLORO-s-TRIAZINETRIONE
PET	PENTAERYTHRITOL
PFA	PARAFORMALDEHYDE
PGA	PYROGALLIC ACID
PGC	POLYPROPYLENE GLYCOL
PGM	POLYPROPYLENE GLYCOL METHYL ETHER
PHG	PHOSGENE
PHH	PHENYLHYDRAZINE HYDROCHLORIDE
PHN	PHENOL
PII	PROPYLENEIMINE, INHIBITED
PLB	POLYBUTENE
PLP	POLYPROPYLENE
PLT	beta-PROPIOLACTONE
PME	PROPYLENE GLYCOL METHYL ETHER
PMN	n-PROPYL MERCAPTAN
PNA	PROPIONIC ACID
POP	POTASSIUM PEROXIDE
POX	PROPYLENE OXIDE
PPA	POLYPHOSPHORIC ACID
PPG	PROPYLENE GLYCOL
PPI	POLYMETHYLENE POLYPHENYL ISOCYANATE
PPL	PROPYLENE
PPO	PHOSPHORUS OXYCHLORIDE
PPP	PHOSPHORUS PENTASULFIDE
PPR	PHOSPHORUS, RED
PPT	PHOSPHORUS TRICHLORIDE
PPW	PHOSPHORUS, WHITE
PPZ	PIPERAZINE
PRD	PYRIDINE
PRP	PROPANE

INDEX OF CODES (Continued)

PTA	PENTANE
PTB	PENTABORANE
PTC	POTASSIUM CYANIDE
PTD	POTASSIUM DICHROMATE
PTE	1-PENTENE
PTH	POTASSIUM HYDROXIDE
PTI	POTASSIUM IODIDE
PTL	PETROLATUM
PTM	POTASSIUM, METALLIC
PTN	PETROLEUM NAPHTHA
PTO	PARATHION, LIQUID
PTP	POTASSIUM PERMANGANATE
PTS	POTASSIUM OXALATE
PTT	PROPYLENE TETRAMER
QNL	QUINOLINE
RSC	RESORCINOL
SAB	SODIUM ALKYLBENZENESULFONATES
SAC	SULFURIC ACID, SPENT
SAM	SODIUM AMIDE
SAR	SODIUM ARSENITE
SAS	SODIUM ALKYL SULFATES
SAZ	SODIUM AZIDE
SBH	SODIUM BOROHYDRIDE
SBS	SODIUM BISULFITE
SBT	SORBITOL
SCD	SODIUM CACODYLATE
SCH	SODIUM CHROMATE
SCL	SULFURYL CHLORIDE
SCN	SODIUM CYANIDE
SCR	SODIUM DICHROMATE
SCY	SODIUM THIOCYANATE
SDA	SODIUM ARSENATE
SDB	SODIUM BORATE
SDC	SODIUM CHLORATE
SDF	SODIUM FLUORIDE
SDH	SODIUM HYDRIDE
SDS	SODIUM SULFIDE
SDT	SODIUM DICHLORO-S-TRIAZINETRIONE
SDU	SODIUM
SFA	SULFURIC ACID
SFC	SODIUM FERROCYANIDE
SFD	SULFUR DIOXIDE
SFL	SULFOLANE
SFM	SULFUR MONOCHLORIDE
SFR	SODIUM SILICOFLUORIDE
SHC	SODIUM HYPOCHLORITE
SHD	SODIUM HYDROXIDE
SHS	SODIUM HYDROSULFIDE SOLUTION
SLA	SALICYLIC ACID
SLD	SELENIUM DIOXIDE
SML	SODIUM METHYLATE
SNT	SODIUM NITRITE
SOX	SODIUM OXALATE
SPP	SODIUM PHOSPHATE
SRA	STEARIC ACID
SRS	SUCROSE
SSC	SODIUM SILICATE
SSF	SODIUM SULFITE
STC	SILICON TETRACHLORIDE
STO	SELENIUM TRIOXIDE
STY	STYRENE
SVA	SILVER ACETATE
SVC	SILVER CARBONATE
SVF	SILVER FLUORIDE
SVI	SILVER IODATE

INDEX OF CODES (Continued)

SVN	SILVER NITRATE
SVO	SILVER OXIDE
SVS	SILVER SULFATE
SXX	SULFUR (LIQUID)
TAL	TRIETHYLALUMINUM
TAP	p-TCLUENESULFONIC ACID
TBT	TETRABUTYL TITANATE
TCA	2,4,5-TRICHLOROPHENOXYACETIC ACID
TCE	TRICHLOROETHANE
TCF	TRICHLOROFLUOROMETHANE
TCL	TRICHLOROETHYLENE
TCP	TRICRESYL PHOSPHATE
TCS	TRICHLOROSILANE
TCT	TRICHLORO-s-TRIAZINETRIONE
TDB	TETRADECYLBENZENE
TDC	1-TRIDECENE
TDI	TOLUENE 2,4-DIISOCYANATE
TDN	TRIDECANOL
TEA	TRIETHANOLAMINE
TEB	TRIETHYLBENZENE
TEC	TETRACHLOROETHANE
TED	TETRAETHYL DITHIOPYROPHOSPHATE
TEG	TRIETHYLENE GLYCOL
TEL	TETRAETHYL LEAD
TEN	TRIETHYLAMINE
TEP	TETRAETHYL PYROPHOSPHATE
TES	2,4,5-T (ESTERS)
TET	TRIETHYLENETETRAMINE
TFA	TALLOW FATTY ALCOHOL
TFC	TRIFLUOROCHLOROETHYLENE
TFE	TETRAFLUOROETHYLENE, INHIBITED
TFR	TRIFLURALIN
TGC	TRIPROPYLENE GLYCOL
THF	TETRAHYDROFURAN
THN	TETRAHYDRONAPHTHALENE
THR	THIRAM
TIA	TRIISOBUTYLALUMINUM
TLI	o-TOLUIDINE
TLO	TALLOW
TMA	TRIMETHYLAMINE
TMC	TRIMETHYLCHLOROSILANE
TML	TETRAMETHYL LEAD
TNA	TANNIC ACID
TOL	TOLUENE
TPG	THIOPHOSGENE
TPH	TRICHLOROPHENOL
TPO	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
TPT	TURPENTINE
TRN	THORIUM NITRATE
TTD	1-TETRADECENE
TTE	TETRACHLOROETHYLENE
TTG	TETRAETHYLENE GLYCOL
TTN	TETRADECANOL
TTP	TETRAETHYLENEPENTAMINE
TTT	TITANIUM TETRACHLORIDE
TXP	TOXAPHENE
UAN	URANYL NITRATE
UDB	n-UNDECYLBENZENE
UDC	1-UNDECENE
UND	UNDECANOL
UPO	UREA PEROXIDE
URA	URANYL ACETATE
URE	UREA
URS	URANYL SULFATE
VAL	VALERALDEHYDE
VAM	VINYL ACETATE

INDEX OF CODES (Continued)

VCI	VINYLIDENECHLORIDE, INHIBITED
VCM	VINYL CHLORIDE
VFI	VINYL FLUORIDE, INHIBITED
VME	VINYL METHYL ETHER, INHIBITED
VNT	VINYLTOLUENE
VOT	VANADIUM OXYTRICHLORIDE
VOX	VANADIUM PENTOXIDE
VSF	VANADYL SULFATE
VTS	VINYLTRICHLOROSILANE
WCA	WAXES: CARNAUBA
WPF	WAXES: PARAFFIN
XLM	m-XYLENE
XLO	o-XYLENE
XLP	p-XYLENE
XYL	XYLENOL
ZAC	ZINC AMMONIUM CHLORIDE
ZAR	ZINC ARSENATE
ZBO	ZINC BORATE
ZBR	ZINC BROMIDE
ZCA	ZIRCONIUM ACETATE
ZCL	ZINC CHLORIDE
ZCO	ZIRCONIUM OXYCHLORIDE
ZCR	ZINC CHROMATE
ZCS	ZIRCONIUM SULFATE
ZDP	ZINC DIALKYLDITHIOPHOSPHATE
ZFB	ZINC FLUOROBORATE
ZIR	ZIRCONIUM NITRATE
ZNA	ZINC ACETATE
ZNT	ZINC NITRATE
ZPP	ZINC PHOSPHIDE
ZPS	ZINC PHENOLSULFONATE
ZSF	ZINC SULFATE
ZSL	ZINC SILICOFLUORIDE

10. DATA SOURCES

The source of every item of data contained in Section 11 is recorded in master data files and is available on request. The principal sources are listed below. Many other sources were consulted, but most of them provided only a few items and are not given here. In a few cases the information given is based on an analogy with that for a closely related chemical; the analogy was drawn by an expert in the field, whose identity appears in the master data file.

Where a source was used for a single category of data, the source is given in Section 3 ("Explanation of Terms") and is not repeated here.

10.1 GENERAL SOURCES

The following sources contained data for many of the 13 data categories used:

1. Manufacturers' Technical Bulletins – This is usually the best single source of general information about the chemical. All bulletins were solicited in late 1972 and contain the most recent data. Bulletins were not available for a few chemicals that are not items of commerce but are intermediates shipped from one manufacturing site to another.

2. Material Safety Data Sheets – These were provided by the manufacturer using the U.S. Department of Labor Form OSHA-20 or an approved modification.

3. Code of Federal Regulations – Office of the Federal Register, Archives and Record Service, Washington, D.C., 1972. Titles 46 (Shipping) and 49 (Transportation) were used in the most recent revision available, in all cases since January 1, 1971.

4. Chemical Safety Data Sheets – Manufacturing Chemists Association, Washington, D.C.

5. Industrial Safety Data Sheets – National Safety Council, Chicago, Illinois.

6. International Maritime Dangerous Goods Code – Inter-Governmental Maritime Consultative Organization (IMCO), London, 1972.

7. Petroleum Products Handbook – V.B. Guthrie (ed.), McGraw-Hill, New York, 1960.

8. Glossary of Terms Used in Petroleum Refining – 2nd edition, American Petroleum Institute, New York, 1962.

9. The Handling and Storage of Liquid Propellants – Office of Defense Research and Engineering, U.S. Government Printing Office, Washington, D.C., 1963.

10. Industrial Chemicals – W.L. Faith, D.B. Keyes, and R.L. Clark, 3rd edition, Wiley, New York, 1965.

11. Chemical Technology of Petroleum – W.A. Gruse and D.R. Stevens, 3rd edition, McGraw-Hill, New York, 1960.

12. Chemical Rocket/Propellant Hazards – CPIA Publication No. 194, Vol. III, 1970.

13. Organic Solvents – J.A. Riddick and W.B. Bunger, 3rd edition, Wiley-Interscience, New York, 1970.

14. Transport of Dangerous Goods – (4 vols) United Nations, New York, 1970.

15. Kirk-Othmer Encyclopedia of Chemical Technology – 1st edition (1947-1960) and 2nd edition (1963-1970), Interscience-Wiley, New York.

16. Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide – National Academy of Sciences, Washington, D.C., 1970; includes supplement with additions to March 1972.

17. Matheson Gas Data Book – 5th edition, Matheson Gas Products, East Rutherford, New Jersey, 1971.

18. Explosive and Toxic Hazardous Materials – J. H. Meidl, Glencoe Press, Beverly Hills, California, 1969.

20. Organic Phosphorus Compounds – G. M. Kosolapoff and L. Maier (6 Vols.), Wiley-Interscience, New York.

21. The Chemistry of Organo-Phosphorus Pesticides – C. Fest and K. J. Schmidt, Springer-Verlag, New York, 1973.

10.2 CHEMICAL DESIGNATIONS

1. Commercial Organic Chemical Names – Compiled by the Synthetic Organic Chemical Manufacturers Association (SOCMA), Chemical Abstracts Service, Columbus, Ohio, 1965.

2. Chemical Synonyms and Trade Names – W. Gardner and E.I. Cooke, 7th edition, CRC press, Cleveland, Ohio, 1971.

3. The Merck Index of Chemicals and Drugs – 8th edition, Merck and Co., Rahway, New Jersey, 1968.

10.3 HEALTH HAZARDS

1. Industrial Hygiene and Toxicology – F.A. Patty, 2nd edition, Vol. II, Interscience, New York, 1963.

2. Toxicity and Metabolism of Industrial Solvents – E. Browning, Elsevier, New York, 1965.

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4. Industrial Toxicology – L.T. Fairhall, Williams and Wilkins, 2nd edition, Baltimore, Maryland, 1957.

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11. CHEMICAL-SPECIFIC INFORMATION

AAD ACETALDEHYDE

Common Synonyms
Acetic aldehyde
Ethanal

Watery liquid | Colorless | Sharp fruity odor

Floats and mixes with water. Flammable, irritating vapor is produced. Boiling point is 69° F

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic aldehyde; Ethanal; Ethyl aldehyde
3.2 **Coast Guard Compatibility Classification:** Aldehyde
3.3 **Chemical Formula:** CH_3CHO
3.4 **IMCO United Nations Numerical Designation:** 3.1 1089

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Penetrating fruity sharp pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, eye goggles, and other equipment to prevent any contact with body. Organic canister or air pack as required.
5.2 **Symptoms Following Exposure:** Breathing vapors will be irritating and may cause nausea, vomiting, headache and unconsciousness. Contact with eyes may cause burns. Skin contact from clothing wet with the chemical causes burns or severe irritation.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if breathing has stopped give artificial respiration. If breathing difficult give oxygen; call a physician at once. SKIN: wash with soap and water. EYES: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** 50 ppm for 60 min.
5.6 **Toxicity by Ingestion:** Grade 2. LD$_{50}$: 0.5 g/kg (rats).
5.7 **Late Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. Repeated contacting and allowed to remain may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.21 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** −36°F C.C. = −56°F O.C.
6.2 **Flammable Limits in Air:** 4 - 60%
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Produces irritating vapor when heated
6.6 **Behavior in Fire:** Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 365°F
6.8 **Electrical Hazard:** Class I, Group C
6.9 **Burning Rate:** 3.1 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** May occur. Avoid heat, dust, strong oxidizing or reducing substances, strong acids and bases
7.6 **Inhibitor of Polymerization:** None

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 53 ppm/96 hr/sunfish/TLm/fresh water; 70 ppm/24 hr/perch/TLm/salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 63-12% 5 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Division
245 Park Ave.
New York, N.Y. 10017
2. Eastman Kodak Co.
Texas Eastman Co. Division
Longview, Texas 75601
3. Union Carbide Corp.
Chemicals & Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** >99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Inerted
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A B C K I — N Z

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	1
Poison	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 44.05
13.3 **Boiling Point at 1 atm:** 69.7°F = 20.4°C = 293.6°K
13.4 **Freezing Point:** −184°F = −123°C = 150°K
13.5 **Critical Temperature:** 370°F = 188°C = 461°K
13.6 **Critical Pressure:** 926 psia = 63 atm = 6.4 MN/m²
13.7 **Specific Gravity:** 0.780 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 1.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.182
13.12 **Latent Heat of Vaporization:** 248 Btu/lb = 138 cal/g = 5.69 × 10⁵ J/kg
13.13 **Heat of Combustion:** −13,600 Btu/lb = −7560 cal/g = −316.4 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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AAC	# ACETIC ACID

Glacial acetic acid
Ethanoic acid
Vinegar acid

Watery liquid | Colorless | Strong vinegar odor

Sinks and mixes with water. Irritating vapor is produced. Freezing point is 62° F.

Fire

Combustible
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to nose and throat
If inhaled, will cause coughing, nausea, vomiting, or difficult breathing.

LIQUID OR SOLID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Toxic vapor; corrosive
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
Ethanoic acid
Glacial acetic acid
Vinegar acid

3.2 Coast Guard Compatibility Classification:
Organic acid

3.3 Chemical Formula: CH_3COOH

3.4 IMCO/United Nations Numerical Designation: UN 2789

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid

4.2 Color: Colorless

4.3 Odor: Characteristic sharp, pungent vinegar-like odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective clothing should be worn when skin contact might occur. Respirators protection necessary when exposed to vapor. Complete eye protection.

5.2 Symptoms Following Exposure: Breathing of vapors causes coughing, chest pain and irritation of nose and throat; may cause nausea and vomiting. Contact with skin causes burns.

5.3 Treatment of Exposure: INHALATION: move victim to fresh air. If breathing becomes difficult give oxygen. Get medical care quickly. INGESTION: if victim is conscious, have him drink water or milk. Do NOT induce vomiting. SKIN OR EYE CONTACT: flush immediately with plenty of clean running water; wash eyes for at least 15 min. and get medical care as quickly as possible. Remove contaminated clothing and launder before wearing again.

5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm

5.5 Short-Term Inhalation Limits: 40 ppm for 5 min.

5.6 Toxicity by Ingestion: Grade 2; LD50 = 3.0 g/kg (rat)

5.7 Late Toxicity: Data not available

5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate eye irritation with lacrimation and mild irritation of nose and throat at high concentrations. Irritation is temporary.

5.9 Liquid or Solid Irritant Characteristics: Liquid causes severe skin irritation; may cause pain and second degree burns after a few minutes of contact.

5.10 Odor Threshold: 1.0 ppm

6 FIRE HAZARDS

6.1 Flash Point: 112°F (OC) 104°F (CC)

6.2 Flammable Limits in Air: 5.4% - 16.0%

6.3 Fire Extinguishing Agents: Water, alcohol foam, dry chemical or carbon dioxide

6.4 Fire Extinguishing Agents Not to be Used: None

6.5 Special Hazards of Combustion Products: Irritating vapor generated when heated

6.6 Behavior in Fire: Not pertinent

6.7 Ignition Temperature: 800°F

6.8 Electrical Hazard: Not pertinent

6.9 Burning Rate: 1.6 mm/min

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction

7.2 Reactivity with Common Materials: Corrosive particularly when diluted. Attacks most common metals including most stainless steels. Excellent solvent for many synthetic resins or rubber.

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: Dilute with water; rinse with sodium bicarbonate solution.

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity:
Tolerance limit bluegill: 11 ppm fresh water; 49 ppm Pacific goldfish: 11 ppm fresh water; 189-330 ppm 48 hr shrimp: 13 ppm aerated water

8.2 Waterfowl Toxicity: Not pertinent

8.3 Biological Oxygen Demand (BOD): 52-62% 5 days

8.4 Food Chain Concentration Potential: None noted

9 SELECTED MANUFACTURERS

1. Celanese Corp
Celanese Chemical Co. Div.
245 Park Ave.
New York, N.Y. 10017

2. Eastman Kodak Co.
Tennessee Eastman Co. Div.
Kingsport, Tenn. 37662

3. Union Carbide Corp.
Chemicals & Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 Grades of Purity: Commercial, USP, CP

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: No requirement

10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
Corrosive Material

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicants	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
Liquid

13.2 Molecular Weight: 60.05

13.3 Boiling Point at 1 atm:
244°F = 117.9°C = 391.1°K

13.4 Freezing Point: 62.1°F = 16.7°C = 290°K

13.5 Critical Temperature:
612°F = 321.6°C = 594.8°K

13.6 Critical Pressure:
838 psia = 57.1 atm = 5.78 MN/m²

13.7 Specific Gravity: 1.051 at 20°C (liquid)

13.8 Liquid Surface Tension: Not pertinent

13.9 Liquid-Water Interfacial Tension:
Not pertinent

13.10 Vapor (Gas) Specific Gravity:
Not pertinent

13.11 Ratio of Specific Heats of Vapor (Gas):
1.15

13.12 Latent Heat of Vaporization:
174 Btu/lb = 96.7 cal/g = 5.05 × 10⁵ J/kg

13.13 Heat of Combustion: -5151 Btu/lb
= -3.0 kcal/g = -1.3 × 10⁷ J/kg

13.14 Heat of Decomposition: Not pertinent

13.15 Heat of Solution: Not pertinent

13.16 Heat of Polymerization: Not pertinent

Continued on page 3 and 4

NOTES

ACA — ACETIC ANHYDRIDE

Common Synonyms
Ethanoic anhydride

Watery liquid Colorless Strong vinegar odor

Sinks and reacts slowly with water. Irritating vapor is produced.

Fire

Combustible.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Will burn eyes.
Irritating to nose and throat.
If inhaled, will cause tearing, vomiting, or difficult breathing.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: isolate.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethanoic anhydride
3.2 **Coast Guard Compatibility Classification:** Organic anhydride
3.3 **Chemical Formula:** $CH_3COOCOCH_3$
3.4 **IMCO United Nations Numerical Designation:** No. 1715

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Very strong, pungent, vinegar-like characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing when skin contact might occur. Respiratory protection necessary for all exposures; complete eye protection.
5.2 **Symptoms Following Exposure:** Liquid is irritating and causes a burning sensation. Unprotected skin contact causes severe burns when clothing is wet with the chemical. Vapor causes severe burning sensation of eyes, severe burns and irritation to respiratory tract. Nausea and vomiting may develop after exposure.
5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air. If breathing becomes difficult, give oxygen. Get medical care quickly. INGESTION: do NOT induce vomiting. SKIN OR EYE CONTACT WITH LIQUID OR VAPOR: flush immediately with plenty of clean running water. Remove clothing as soon as possible. Wash skin and get medical care quickly.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2: Moderately toxic
5.7 **Late Toxicity:** Not pertinent
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors immediately irritating to eyes. Not pertinent. Not generally irritating to skin. Not pertinent. Not generally irritating to upper respiratory tract. Not generally irritating to lower respiratory tract.
5.9 **Liquid or Solid Irritant Characteristics:** Liquid irritating to eyes. May cause pain and severe burns after a few minutes of contact.
5.10 **Odor Threshold:** 0.4 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 116°F O.C., 120°F C.C.
6.2 **Flammable Limits in Air:** 2.7% - 10.0%
6.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam, or carbon dioxide.
6.4 **Fire Extinguishing Agents Not to be Used:** Water and foam react, but heat liberated is not enough to create a hazard. Dry chemical forced below the surface can cause foaming and boiling.
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 600°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly with water; considerable heat liberated when water spray is used.
7.2 **Reactivity with Common Materials:** Corrosive to steel and other metals.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water and solid bicarbonate; solution to rinse.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 96 ppm/96 hr/bluegill/Tm/fresh water; 100-300 ppm/24 hr/shrimp/LC/salt water
8.2 **Waterfowl Toxicity:** Not pertinent
8.3 **Biological Oxygen Demand (BOD):** 53% 5 days
8.4 **Food Chain Concentration Potential:** None noted

9. SELECTED MANUFACTURERS

1. Celanese Corp.
   Celanese Chemical Co. Div.
   245 Park Ave.
   New York, N.Y. 10017
2. Eastman Kodak Co.
   Tennessee Eastman Co. Div.
   Kingsport, Tenn. 37662
3. Union Carbide Corp.
   Chemicals and Plastics Div.
   270 Park Ave.
   New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure: 99% min.
Technical: 90-95% min.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vent

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

APQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive Material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	2
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	1
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 102.09
13.3 **Boiling Point at 1 atm:** 282°F = 139°C = 412°K
13.4 **Freezing Point:** -100.3°F = -73.5°C = 199.7°K
13.5 **Critical Temperature:** 569°F = 296°C = 569°K
13.6 **Critical Pressure:** 670 psia = 46.2 atm = 4.68 MN/m²
13.7 **Specific Gravity:** 1.08 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** 169 Btu/lb = 94 cal/g = 3.9 × 10⁵ J/kg
13.13 **Heat of Combustion:** -7095 Btu/lb = -3942 cal/g = -164.2 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

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ACT

ACETONE

Common Synonyms
Dimethyl Ketone
Propanone

Watery liquid | Colorless | Sweet odor

Floats and mixes with water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, may cause difficult breathing or loss of consciousness.

LIQUID
Irritating to eyes.
Not irritating to skin.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Isolate material. Stop flammables.
Dispose and Clean.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dimethyl Ketone; 2-Propanone
3.2 **Coast Guard Compatibility Classification:** Acetone
3.3 **Chemical Formula:** CH_3COCH_3
3.4 **IMCO Uniform Nations Numerical Designation:** 1090

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sweetish, pleasant, somewhat ether-like odor at low concentrations; pungent, sharp, penetrating odor at higher concentrations.

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask; synthetic rubber gloves; chemical safety goggles or face splash shield.
5.2 **Symptoms Following Exposure:** INHALATION: vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations. INGESTION: same order of toxicity but very irritating to mucous membranes. SKIN: prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis.
5.3 **Treatment for Exposure:** INHALATION: if symptoms appear, remove to fresh air and call a physician. If not breathing, administer artificial respiration; if breathing is irregular or stopped, INGESTION: if victim has swallowed large amounts, and is conscious, induce vomiting and get medical help promptly. No specific antidote known. SKIN: wash well with water. EYES: flush with water immediately for at least 15 min. Consult a physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm
5.5 **Short-Term Inhalation Limits:** 1000 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 1. LD_{50} (oral, rat): 5.8 g/kg
5.7 **Late Toxicity:** Not pertinent.
5.8 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors cause moderate irritation of the eyes, respiratory system. Effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly from the skin.
5.10 **Odor Threshold:** 100 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 4°F (O.C.), 0°F (C.C.)
6.2 **Flammable Limits in Air:** 2.6% - 12.8%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water is ineffective but stream will scatter and spread fire and should not be used.
6.5 **Special Hazards of Combustion Products:** Not pertinent.
6.6 **Behavior in Fire:** Not pertinent.
6.7 **Ignition Temperature:** 869°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 3.9 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 4,250 ppm/24 hr/fathead minnow/soft water; 8,300 ppm/48 hr/mosquito fish/turbid water
8.2 **Waterfowl Toxicity:** Not pertinent.
8.3 **Biological Oxygen Demand (BOD):** 1.16 oz/lb (115% in 5 days)
8.4 **Food Chain Concentration Potential:** None noted.

9 SELECTED MANUFACTURERS

Allied Chemical Corp.
Specialty Chemicals Div.
Wilmington, Delaware
Marcus Hook, Pa. 19061

Shell Chemical Co.
Industrial Chemicals Div.
Houston, Texas 77001

Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

*10.1 **Grades or Purity:** Technical: 99.5% plus 0.5% water. Reagent: 99.5% plus 0.5% water.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
*10.4 **Venting:** Open flame arrester or pressure vacuum

*11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2.

VPQPS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
*12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 58.1
*13.3 **Boiling Point at 1 atm:** 133°F = 56.1°C = 329.3°K
13.4 **Freezing Point:** -139°F = -94.7°C = 178.5°K
13.5 **Critical Temperature:** 455°F = 235°C = 508°K
13.6 **Critical Pressure:** 682 psia = 46.4 atm = 4.70 MN/m²
13.7 **Specific Gravity:** 0.792 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent.
13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
13.10 **Vapor (Gas) Specific Gravity:** 2
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.13
13.12 **Latent Heat of Vaporization:** 220 Btu/lb = 123 cal/g = 5.14 x 10⁵ J/kg
13.13 **Heat of Combustion:** -12,390 Btu/lb = -6880 cal/g = -28.8 x 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent.
13.15 **Heat of Solution:** Not pertinent.
13.16 **Heat of Polymerization:** Not pertinent.

Continued on page 2

NOTES

REVISED 1978

ACY — ACETONE CYANOHYDRIN

Common Synonyms
2-Methyl lactonitrile
Alpha-hydroxy isobutyronitrile

Watery liquid | Colorless | Mild almond odor

Floats and mixes with water. Poisonous vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear chemical protective suit and self-contained breathing apparatus
Stop discharge if possible
Stay upwind and keep out of low areas
Call fire department
Isolate and deny entry to unprotected personnel
Notify authorities if spill enters water

Fire

Combustible
POISONOUS GASES ARE PRODUCED WHEN HEATED
Vapor may explode if ignited in an enclosed area

WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS
Cool containers with water spray until well after fire is out
Extinguish with water. Chemical agents may react to release toxic gas
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

Move victim to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen
LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Remove contaminated clothing at once
Flush eyes with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give anything by mouth

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

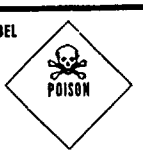
Notify local health and wildlife officials
Notify operators of canals, water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison
Restrict access
Should be removed: human toxicity

2 LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** alpha Hydroxyisobutyronitrile
2 Methyllactonitrile
3 2 **Coast Guard Compatibility Classification:** Cyanohydrin
3 3 **Chemical Formula** $(CH_3)_2COHCN$
3 4 **IMCO/United Nations Numerical Designation:** 6 1 1541

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color.** Colorless
4 3 **Odor** Characteristic, distinct, strong cyanide

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air supplied mask with canister approved for use with acetonitrile in less than 2% concentrations; rubber or plastic gloves; cover goggles or face mask; rubber boots; slicker suit; inlets taped.

5 2 **Symptoms Following Exposure:** At low dosages the earliest symptoms may be weakness, headaches, confusion and occasionally nausea and vomiting. Respirators rate and depth will usually be increased at the beginning and at later stages become slow and gasping.

5 3 **Treatment for Exposure:** Call a physician for all cases of exposure. INHALATION: remove victim to fresh air. (Rescuer should wear suitable mask.) INGESTION: if victim is conscious, induce vomiting by having him drink strong salt water. SKIN: remove contaminated clothing and wash affected skin thoroughly with soap and water. EYES: hold eyelids apart and wash with continuous gentle stream of water for at least 15 min.
If breathing has stopped, give artificial respiration until physician arrives. If victim is unconscious, administer amyl nitrite by crushing an ampule in a cloth and holding it under his nose for 15 seconds in every minute. Do not interrupt artificial respiration during this procedure. Replace ampule when its strength is spent. Continue treatment until victim's condition improves or physician arrives.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, below 50 mg/kg (mice)

5 7 **Late Toxicity:** Causes liver damage in rats

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors irritate the eyes and respiratory system if present in high concentrations. The effect is temporary.

Continued on page 4

6 FIRE HAZARDS

6 1 **Flash Point** 100°F C.C.
6 2 **Flammable Limits in Air:** 2.2% - 12%
6 3 **Fire Extinguishing Agents** Water spray, dry chemical, alcohol foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic hydrogen cyanide is generated when heated
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** 1270°F
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Not pertinent
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** Data not available

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 West St. Paul Ave
Milwaukee, Wis. 53233
2 Eastman Kodak Co
Rochester, New York 14650
3 Rohm and Haas Co
Independence Mall West
Philadelphia, Pa. 19105

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 98, 99%
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	3
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	1
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 85.11
13 3 **Boiling Point at 1 atm:** Decomposes
13 4 **Freezing Point.** $-6.5°F = -21°C = 252°K$
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 0.925 at 25°C (liquid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** (est.) 1.074
13 12 **Latent Heat of Vaporization** Data not available
13 13 **Heat of Combustion** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4

5. HEALTH HAZARDS (Cont'd)

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns on long exposure
5 10 **Odor Threshold:** Data not available

ATN	# ACETONITRILE

Common Synonyms
Methyl cyanide
Cyanomethane
Ethanenitrile

Watery liquid | Colorless | Sweet odor

Floats and mixes with water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause difficult breathing.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook. CG 446-6)

Issue warning. High flammability.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Ethanenitrile
Ethyl nitrile
Cyanomethane
Methyl cyanide

3.2 **Coast Guard Compatibility Classification:**
Nitrile

3.3 **Chemical Formula.** CH_3CN

3.4 **IMCO/United Nations Numerical Designation.** 6.1/1648

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweet, ethereal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus.

5.2 **Symptoms Following Exposure.** Exposure to 160 ppm for 4 hrs causes flushing of the face and a feeling of constriction in the chest. 500 ppm for brief periods is irritating to the nose and throat. Severe exposures cause irritability, skin eruptions, confusion, delirium, convulsions, paralysis and death due to central nervous system depression.

5.3 **Treatment for Exposure:** Remove victim from contaminated atmosphere. Give artificial respiration and oxygen if respiration is impaired.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 40 ppm

5.5 **Short-Term Inhalation Limits.** 40 ppm for 60 min

5.6 **Toxicity by Ingestion.** Grade 3. LD50 = 500 mg/kg (guinea pig)

5.7 **Late Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. Effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5.10 **Odor Threshold.** 4 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 42°F, CC

6.2 **Flammable Limits in Air:**
4.4% - 16%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Toxic vapors are generated when heated.

6.6 **Behavior in Fire.** Vapor heavier than air and may travel a considerable distance to a source of ignition and flash back.

6.7 **Ignition Temperature.** 975°F

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** 2.7 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 1180 ppm/24 hr/fathead minnow/Flow hard water

8.2 **Waterfowl Toxicity.** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** 1.76 % days

8.4 **Food Chain Concentration Potential.** None noted

9. SELECTED MANUFACTURERS

1. American Cyanamid Co.
Industrial Chemicals and Plastics Division
New Orleans, La. 70121

2. Eastman Kodak Co.
Texas Eastman Co. Division
Longview, Texas 75601

3. Vistron Corp.
Midland Building
Cleveland, Ohio 44115

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook. CG 446-3)

V-P Q R S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
Liquid

13.2 **Molecular Weight.** 41.05

13.3 **Boiling Point at 1 atm.**
179°F = 81.6°C = 354.8°K

13.4 **Freezing Point:**
−50.3°F = −45.7°C = 227.5°K

13.5 **Critical Temperature:**
526.5°F = 274.7°C = 547.9 K

13.6 **Critical Pressure.**
701 psia = 47.7 atm = 4.83 MN/m²

13.7 **Specific Gravity:** 0.787 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.4

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.192

13.12 **Latent Heat of Vaporization**
313 Btu/lb = 174 cal/g = 7.29 × 10⁵ J/kg

13.13 **Heat of Combustion:** −13,360 Btu/lb
= −7420 cal/g = −3.17 × 10⁷ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

ACP	# ACETOPHENONE

Common Synonyms
Acetylbenzene
Methyl phenyl ketone

Liquid | Colorless | Flowery, sweet odor

Sinks slowly in water. Freezing point is 68° F

Fire

Combustible.

Exposure

CALL FOR MEDICAL AID

LIQUID OR SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Acetylbenzene
Methyl phenyl ketone

3 2 **Coast Guard Compatibility Classification:** Ketone

3 3 **Chemical Formula:** $C_6H_5COCH_3$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Persistent like orange blossoms and jasmine

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protect eyes and skin from direct contact

5 2 **Symptoms Following Exposure:** No toxicity expected from inhalation or ingestion except slight narcotic effect. Liquid can cause eye and skin irritation on contact

5 3 **Treatment for Exposure:** SKIN OR EYE CONTACT: Irrigate affected area with water for 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2. LD$_{50}$ 0.5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Nonirritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold:** 0.01 - 0.025 mg/m^3

6 FIRE HAZARDS

6 1 **Flash Point:** 180°F (C.C.)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** None

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

5 7 **Ignition Temperature:** 1058°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None noted

9 SELECTED MANUFACTURERS

1 Givaudan Corp
Aroma Chemicals Div
125 Delawanna Ave
Clifton, N J 07014

2 Orbis Products Corp
475 Tenth Ave
New York, N Y 10018

3 Union Carbide Corp
Chemicals & Plastics Div
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, 99% acetophenone

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

YTUXY

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 120.15

13 3 **Boiling Point at 1 atm:**
395.1°F = 201.7°C = 474.9°K

13 4 **Freezing Point:** 67.5°F = 19.7°C = 292.5°K

13 5 **Critical Temperature:**
802°F = 428°C = 701°K

13 6 **Critical Pressure:**
860 psia = 58 atm = 5.8 MN/m

13 7 **Specific Gravity:** 1.028 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
42 dynes/cm = 0.042 N/m at 30°C

13 9 **Liquid-Water Interfacial Tension:**
(est.) 40 dynes/cm = 0.04 N/m at 27°C

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
(est.) 1.071

13 12 **Latent Heat of Vaporization:**
150 Btu/lb = 83.6 cal/g =
3.5 × 10^5 J/kg

13 13 **Heat of Combustion:** −14,850 Btu/lb
= −8250 cal/g = −345.4 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

ATA

ACETYLACETONE

Common Synonyms
2,4-Pentanedione
Diacetylmethane

Liquid | Colorless | Unpleasant Odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced.

Shut off ignition sources. Call fire department.
Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Isolate and ventilate discharge material.
Notify local health and pollution control agencies.

Fire

Combustible
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals, alcohol foam, carbon dioxide.
Water may be ineffective on fire.
Cool containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes.
If inhaled will cause dizziness, coughing, headache, or loss of consciousness.
If in eyes, hold eyelids open and flush with plenty of water.
If victim is not breathing, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diacetylmethane; 2,4-Pentanedione
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** $CH_3COCH_2COCH_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Water white
4 3 **Odor:** Unpleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses; eye bath and safety shower; air supplied mask for concentrations above 2%
5 2 **Symptoms Following Exposure:** Inhalation causes dizziness, headache, nausea, vomiting and loss of consciousness. Contact with liquid irritates eyes.
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air; if victim is not breathing, give artificial respiration and then oxygen; call a physician. EYES or SKIN: flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1 000 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** 105°F (O.C.) 93°F (C.C.)
6 2 **Flammable Limits in Air:** 2.4% - 11.6%
6 3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective on fire
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire.** Vapor is heavier than air and may travel to a source of ignition and flash back
6 7 **Ignition Temperature:** 643°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 3.6 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May dissolve plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

9 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Avenue
New York, N.Y. 10017

2 Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

3 Eastman Organic Chemicals
343 State Street
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P G

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 100.12
13 3 **Boiling Point at 1 atm:** 284.7°F = 140.4°C = 413.6°K
13 4 **Freezing Point:** −10.3°F = −23.5°C = 249.7°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 0.975 at 20°C
13 8 **Liquid Surface Tension:** 31.2 dynes/cm = 0.0312 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 3.45
13 11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.072
13 12 **Latent Heat of Vaporization.** 194 Btu/lb = 108 cal/g = 4.52×10^5 J/kg
13 13 **Heat of Combustion:** −11 070 Btu/lb = −6 150 cal/g = -257×10^5 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** −11.5 Btu/lb = −6.4 cal/g = -0.27×10^5 J/kg
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

ABM

ACETYL BROMIDE

Common Synonyms	Liquid	Colorless	Sharp unpleasant odor
	Flammable, irritating vapor is produced		

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
[illegible]

Fire

FLAMMABLE
Irritating gases are produced when heated
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible] (including gloves)
Extinguish with dry chemical, foam or carbon dioxide
DO NOT USE WATER ON FIRE

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
In case of contact immediately flush eyes with plenty of water for at least 15 minutes
If not breathing, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flood affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting; keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-1)

Issue warning: corrosive
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** CH_3COBr
3.4 **IMCO/United Nations Numerical Designation:** 8/1716

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Acrid and sharp

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety goggles, gloves, adequate ventilation, provisions for flushing eyes or skin with water
5.2 **Symptoms Following Exposure:** Inhalation produces primary irritation of the respiratory tract, symptoms of lung damage may be delayed. Contact with liquid produces primary irritation of eyes and severe skin damage; delayed blistering is not uncommon
5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, if breathing has stopped give artificial respiration, if breathing is difficult, give oxygen, watch for delayed lung damage. EYES: flush with water for at least 15 min., get medical attention. SKIN: flush with water, treat burns as needed
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; oral rat LD_{50} = 3,310 mg/kg; caustic acid. Decomposes violently in water, forming bromic acid and acetic acid)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** 5.0×10^{-1} ppm

5. FIRE HAZARDS

6.1 **Flash Point:** Data not available
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water
6.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen bromide fumes may form in fires
6.6 **Behavior in Fire:** Do not apply water to adjacent fires. Reacts with water to produce toxic and irritating gases
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently forming corrosive and toxic fumes of hydrogen bromide
7.2 **Reactivity with Common Materials:** Attacks and corrodes wood and most metals in the presence of moisture. Flammable hydrogen gas may collect in enclosed spaces
7.3 **Stability During Transport:** Stable if protected from moisture
7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with dilute sodium bicarbonate or soda ash solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Eastman Organic Chemicals
343 State Street
Rochester, N.Y. 14650

2 Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

3 Gallard Schlesinger Chemical Mfg. Co.
584 Mineola Ave.
Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Analytical, Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Padded
10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Liquid
13.2 **Molecular Weight:** 122.95
13.3 **Boiling Point at 1 atm:** 169°F = 76°C = 349°K
13.4 **Freezing Point:** −141.7°F = −96.5°C = 176.7°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.66 at 16°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4.24
13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.144
13.12 **Latent Heat of Vaporization:** 106 Btu/lb = 59 cal/g = 2.5×10^5 J/kg
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and A

NOTES

ACC

ACETYL CHLORIDE

Common Synonyms

Liquid | Colorless | Sharp odor

Reacts violently with water. Irritating visible vapor cloud is produced.

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning - high flammability
corrosive
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** CH_3COCl
3 4 **IMCO/United Nations Numerical Designation:** 1717

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety goggles, rubber or plastic gloves, self contained breathing apparatus
5 2 **Symptoms Following Exposure:** Vapor irritates mucous membranes. Ingestion of liquid or contact with eyes or skin causes severe irritation
5 3 **Treatment for Exposure:** INHALATION: remove from exposure, seek medical attention. EYES: flush with copious amounts of water. SKIN: flush with copious amounts of water. INGESTION: give pints of water, do NOT induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Readily hydrolyzes to form hydrochloric and acetic acids. Oral human LD_{LO} = 1470 mg/kg (acetic acid). Grade 2 oral rat LD_{50} = 3310 mg/kg (acetic acid)
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations
5 9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes
5 10 **Odor Threshold:** Acetic acid 1 ppm, hydrochloric acid 1 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 40°F C.C.
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Carbon dioxide, dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6 5 **Special Hazards of Combustion Products:** When heated to decomposition, hydrogen chloride and phosgene, extremely poisonous gases, are evolved
6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back
6 7 **Ignition Temperature:** 734°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 2.6 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously with water, evolving hydrogen chloride fumes (hydrochloric acid)
7 2 **Reactivity with Common Materials:** Is highly corrosive to most metals in the presence of moisture
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Following dilution with water, limestone or sodium bicarbonate can be used
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N. Y. 14650

2 Allied Chemical Corp.
Specialty Chemicals Division
P. O. Box 1087R
Morristown, N. J. 07960

3 White Chemical Corp.
P. O. Box 278
Bayonne, N. J. 07002

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A-O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive material

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 78.5
13 3 **Boiling Point at 1 atm:** 124°F = 51°C = 324°K
13 4 **Freezing Point:** −170°F = −112°C = 161°K
13 5 **Critical Temperature:** (est.) 475°F = 246°C = 519°K
13 6 **Critical Pressure:** (est.) 845 psia = 57 atm = 5.83 MN/m²
13 7 **Specific Gravity:** 1.1029 at 21°C (liquid)
13 8 **Liquid Surface Tension:** 26 dynes/cm = 0.026 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 3
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.1467
13 12 **Latent Heat of Vaporization:** 160 Btu/lb = 88 cal/g = 3.7 × 10⁵ J/kg
13 13 **Heat of Combustion:** −6 000 Btu/lb = −3 300 cal/g = −140 × 10⁵ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** (est.) 54 Btu/lb = −30 cal/g = −1.3 × 10⁵ J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

ACE	# ACETYLENE

Common Synonyms
Ethyne
Ethine

Compressed gas | Colorless | Mild garlic odor

This flammable gas is slightly lighter than air and will disperse slowly unless confined

Fire

FLAMMABLE.
Containers may explode in fire
Flashback along gas trail may occur
May explode if ignited in an enclosed area

Exposure

GAS
Not irritating to eyes, nose or throat
If inhaled will cause headache, difficult breathing or loss of consciousness.

Water Pollution

Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethine
Ethyne

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** C_2H_2

3.4 **IMCO United Nations Numerical Designation:** 2.0 1001

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Distinctive garlic like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied respirator in areas of high concentration. Avoid all sources of ignition

5.2 **Symptoms Following Exposure:** Headache, dizziness and loss of consciousness may occur. Death from smothering may occur if oxygen content of the air is severely reduced by dilution with acetylene

5.3 **Treatment for Exposure:** INHALATION: no specific antidote known; remove victim to fresh air. Keep him warm and quiet and call doctor; recovery usually rapid. If patient is unconscious, administer oxygen; if breathing has stopped, give artificial respiration

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm (suggested)

5.5 **Short-Term Inhalation Limits:** 100,000 ppm for 30 - 60 min

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** Not pertinent

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Gas

6.2 **Flammable Limits in Air:**
2.5% - 80%

6.3 **Fire Extinguishing Agents:** Stop flow of gas

6.4 **Fire Extinguishing Agents Not to be Used:** Carbon dioxide, dry chemical and water sprays are not generally recommended because the discharged gas or volatile liquid may create a more serious explosion hazard

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May explode in fire

6.7 **Ignition Temperature:** 581°F

6.8 **Electrical Hazard:** Class I, Group A

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Under certain conditions forms spontaneously explosive compounds with copper

7.3 **Stability During Transport:** Stable as shipped

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 1000 cc 1 Ehr sunfish not killed fresh water

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

1. Monochem Inc
P O Box 488
Geismar, Louisiana 70734
2. Monsanto Co
Monsanto Polymers & Petrochemicals Co
800 North Lindbergh Blvd
St Louis, Mo 63166
3. Union Carbide Corp
Chemicals & Plastics Div
270 Park Ave
New York, N Y 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial grade acetylene is supplied dissolved in acetone under pressure in cylinders

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A B C

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Compressed gas

13.2 **Molecular Weight:** 26.04

13.3 **Boiling Point at 1 atm.:** −119°F = −84.0°C = 189.2°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** 95.3°F = 35.2°C = 308.4°K

13.6 **Critical Pressure:** 890.7 psia = 60.59 atm = 6.138 MN/m²

13.7 **Specific Gravity:** 0.613 at −81°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 0.9

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.23

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −20,747 Btu/lb = −11,526 cal/g = −482.57 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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ACETYL PEROXIDE SOLUTION

Common Synonyms			
Diacetyl peroxide solution	Liquid	Colorless	Sharp odor
	Sinks in water		

Fire

Combustible
May explode on contact with combustibles.
Containers may explode in fire

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. Oxidizing material
water contaminant
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diacetyl peroxide solution

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $CH_3COOOOCCH_3$; dimethyl peroxide

3.4 **IMCO/United Nations Numerical Designation:** 5.2/1549

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, rubber apron and glasses

5.2 **Symptoms Following Exposure:** Contact with liquid causes irritation, reddening and blistering of eyes and skin. Ingestion irritates mouth and stomach

5.3 **Treatment for Exposure:** EYES: wash with plenty of water for at least 15 minutes and get medical attention. SKIN: wash with plenty of soap and water. Medical attention should be sought if irritation persists. INGESTION: induce vomiting; drink milk, egg white or water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 111°F O.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May explode. Burns with accelerating intensity

6.7 **Ignition Temperature:** Explodes

6.8 **Electrical Hazard.** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May ignite combustible materials such as wood

7.3 **Stability During Transport:** Heat and shock sensitive; stable; may separate at very low temperatures during transport

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Pennwalt Corporation
Luzidol Division
1740 Military Road
Buffalo, N.Y. 14240

2. Atlas Chemical Division
Day Industries, Inc.
555 Garden Street
Elyria, Ohio 44035

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 25% acetyl peroxide, 75% dimethyl phthalate

10.2 **Storage Temperature:** 32°F (0°C) to 45°F (7°C) or less

10.3 **Inert Atmosphere:** No requirements

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X X Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	3
Reactivity (Yellow)	4

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Mixture

13.3 **Boiling Point at 1 atm.** Decomposes

13.4 **Freezing Point:** 7°F = -14°C = 259°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.2 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.** (est.) 8 dynes/cm = 0.008 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion:** (est.) -3,750 Btu/lb = -1,750 cal/g = -366 × 10⁴ J/kg

13.14 **Heat of Decomposition:** (est.) -50 Btu/lb = -28 cal/g = -2 × 10⁵ J/kg

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

ACD

ACRIDINE

Common Synonyms
Dibenzo[b,e]pyridine
10-Azaanthracene
Benzo[b]quinoline

Solid | Yellow | Weak irritating odor

Sinks in water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 10-Azaanthracene
Benzo(b)quinoline
Dibenzo[b,e]pyridine

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{13}H_9N$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** Weak, somewhat irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator, chemical goggles, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation irritates respiratory system and causes sneezing, coughing, and vomiting. Contact with liquid irritates eyes, skin, and mucous membranes. At high temperature and during sun exposure, damage to the cornea, skin, and mucous membranes may occur following the liberation of acridine vapor.

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if breathing has stopped, give artificial respiration; if breathing is difficult, give oxygen. EYES: wash with copious amounts of water for 20 min.; seek medical attention. SKIN: wash with large amounts of water for 20 min.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2; oral rat LD_{50} = 1,000 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam, monoammonium phosphate, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Carbon dioxide and other dry chemicals may not be effective

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:** Sublimes before melting

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
9.7 ppm/*/perch, kill/fresh water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 W. Saint Paul Avenue
Milwaukee, Wis. 53233

2 Fluka and Bauer, Inc.
129-04 Northern Boulevard
Flushing, N.Y. 11368

3 J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 179.08

13 3 **Boiling Point at 1 atm:**
655°F = 346°C = 619°K

13 4 **Freezing Point:** 230°F = 110°C = 383°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (approx.) 1.2 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −15,800 Btu/lb
= −8790 cal/g = −368 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

ARL

ACROLEIN

Common Synonyms
Acraldehyde
Acrylic aldehyde
Allyl aldehyde
Ethylene aldehyde
2-propenal
Acrylaldehyde

Water liquid | Colorless to light yellow | Sharp irritating odor

Floats and mixes with water. Poisonous flammable vapor is produced.

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED WHEN HEATED
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

LIQUID
POISONOUS IF SWALLOWED
Will burn eyes
Irritating to skin

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acraldehyde
Acrylic aldehyde
2 Propenal
Acrylaldehyde

3.2 **Coast Guard Compatibility Classification:** Aldehyde

3.3 **Chemical Formula:** $CH_2=CH-CHO$

3.4 **IMCO/United Nations Numerical Designation:** UN 1092

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to slightly yellow

4.3 **Odor:** Extremely sharp, lachrymatory, piercing disagreeable extremely irritating acrid pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles and face shield; self-contained breathing apparatus, positive pressure hose mask, gas mask or industrial canister type gas mask; rubber safety shoes; clothing made of rubber or other impervious material

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, a feeling of pressure in the chest and shortness of breath, Nausea and vomiting are usually seen. Loss of consciousness. Exposure has been sufficiently great. Congestion in the chest may be present, causing air spaces and fluid may collect in the lungs. Causes external severe exposed person. Vapor also causes severe eye irritation, redness, weeping, and swelling of eyelid. Liquid [illegible] causes, with severe cases, reddening, blistering. Ingestion causes severe irritation of mouth and stomach.

5.3 **Treatment for Exposure:** Keep patient warm. Do not induce vomiting. Call physician immediately. *Antidote for this compound.* INHALATION: remove patient to fresh air. If breathing becomes difficult give oxygen. If breathing has stopped, start artificial respiration. EYES: immediately flush eyes with water for at least 5 minutes or until medical attention is not immediately available. Continue eye irrigation for another 15 minutes. Upon completion of the first 5 minutes of irrigation, a 1% procaine solution may be used to facilitate effective irrigation. Use eye anesthetic for short period. No other ointments should be used unless ordered by the physician. SKIN: flush at once with large volumes of water. While washing, slightly abrasive and large quantities of running water. INGESTION: Induce vomiting if large amounts of water. Induce vomiting by tickling back of throat. Do not give mechanical or chemical emetics. Dilute with glass of water. Keep patient warm and quiet.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm

Continued on page 4

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Poisonous vapor of acrolein is formed from hot liquid

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Polymerization may take place and containers may explode in fire

6.7 **Ignition Temperature:** 468°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable when inhibited

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Undergoes uncatalyzed polymerization reaction around 200°C. Light promotes polymerization

7.6 **Inhibitor of Polymerization:** Hydroquinone 0.10 to 0.25%

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.08 ppm/24hr sunfish TL$_m$ fresh water
0.055 ppm 96 hr oyster EC$_{50}$ salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 33% 10 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2 Shell Chemical Company
Industrial Chemicals Division
P.O. Box 2463
Houston, Texas 77001

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Industrial 92+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VPQRSZ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	4
Liquid or Solid Irritant	
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effects	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	3
Reactivity (Yellow)	3

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 56.1

13.3 **Boiling Point at 1 atm:** 127.9°F = 53.3°C = 326°K

13.4 **Freezing Point:** −125.1°F = −87°C = 186°K

13.5 **Critical Temperature:** (est.) 459°F = 237°C = 510°K

13.6 **Critical Pressure:** (est.) 735 psia = 50.0 atm = 5.08 MN/m^2

13.7 **Specific Gravity:** 0.843 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 1.94

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.145*

13.12 **Latent Heat of Vaporization:** 216 Btu/lb = 120 cal/g = 5.02 × 10^5 J/kg

13.13 **Heat of Combustion:** −12,500 Btu/lb = −6,950 cal/g = −290 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** (est.) −50 Btu/lb = −28 cal/g = −1.2 × 10^5 J/kg

5 HEALTH HAZARDS (Cont'd)

5.5 **Short-Term Inhalation Limits:** [illegible] ppm for 0.2 ppm for 60 min

5.6 **Toxicity by Ingestion:** Grade 4, LD$_{50}$ below 50 mg/kg

5.7 **Late Toxicity:** Grade 4 oral rat LD$_{50}$ = 46 mg/kg. Grade 4 oral rabbit LD$_{50}$ = 7 mg/kg

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even in low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause severe and deep burns on long exposure.

5.10 **Odor Threshold:** 0.21 ppm

AAM ACRYLAMIDE

Common Synonyms
Propenamide (50%)
Acrylic acid amide (50%)

Liquid | Colorless | Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled

LIQUID
Will warm skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Acrylic amide 50%
Propenamide 50%

3 2 **Coast Guard Compatibility Classification:** Not Listed

3 3 **Chemical Formula:** $CH_2=CHCONH_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Clear

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses with side shields, clear body covering clothing, rubber gloves, boots, apron as dictated by circumstances, in absence of proper environmental control, use approved dust respirator

5 2 **Symptoms Following Exposure:** Has produced central nervous system damage, which is partly reversible. Effects can be produced by oral or skin contact as well as by injection. Chronic acrylamide poisoning can cause midbrain disturbance and peripheral neuropathy. Contact with liquid can cause moderate irritation of eyes and skin and may cause moderate transient corneal injury.

5 3 **Treatment for Exposure:** INHALATION: If ill effects occur, immediately get patient to fresh air. Keep him quiet and warm, and get medical help. INGESTION: If ingested, immediately give large amounts of water (or milk if immediately available), then induce vomiting and get medical help. EYES: Immediately flush with plenty of water for at least 15 min. and get medical help promptly. SKIN: Immediate, continuous and thorough washing in flowing water is imperative, preferably deluge shower with abundant soap; if burns are present, get medical help; discard all contaminated clothing and wearing accessories.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.3 mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, Oral rat LD_{50} = 170 mg/kg

5 7 **Late Toxicity:** Repeated exposure to small amounts may cause essentially reversible neurological effects

(Continued on page 4)

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

5 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be produced in fire

6 6 **Behavior in Fire:** Sealed containers may burst as a result of polymerization

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Unreactive

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** May occur at temperatures above 90°C (200°F)

7 6 **Inhibitor of Polymerization:** Does contain plus 50 ppm of copper as copper sulfate

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 150 ppm/96 hr. static on fish TL_m

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Dow Chemical Co.
Midland, Mich. 48640

2 Vertron Corp.
Midland Building
Cleveland, Ohio 44115

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 15% - 50% solution in water

10 2 **Storage Temperature:** Below 50°C (122°F)

10 3 **Inert Atmosphere:** Ventilated (natural)

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	0
Reactions	
Other Chemicals	2
Water	0
Self Reaction	3

12 3 **NFPA Hazard Classifications:** Data not available

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 71 (solute only)

13 3 **Boiling Point at 1 atm:** Data not available
(Vapor Pressure = 0.033 atm at 125°C)

13 4 **Freezing Point:** 183°F = 84°C = 357°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.05 at 25°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Data not available

(Continued on pages 3 and 5)

5 HEALTH HAZARDS (Cont'd)

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

ACR	# ACRYLIC ACID

Common Synonyms			
Propenoic Acid	Watery liquid	Colorless	Irritating odor

Sinks and mixes with water. Irritating vapor is produced. Freezing point is 54° F.

Fire

Combustible.
POISONOUS GAS MAY BE PRODUCED IN FIRE.
Containers may explode when heated.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.

LIQUID OR SOLID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Isolate hazard area.
Restrict access.
Disperse and flush.

2 LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Propenoic acid
3.2 **Coast Guard Compatibility Classification:** Organic acid
3.3 **Chemical Formula:** $CH_2CHCOOH$
3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Acrid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical respirator at ambient temperatures to avoid inhalation of mist or fumes, rubber gloves if exposed to wet material, and goggles or face shield for splash exposure; safety shower and eye fountain may be required.

5.2 **Symptoms Following Exposure:** May burn skin or eyes upon short contact. INHALATION: eye and nasal irritation and lacrimation. INGESTION: may cause severe damage to the gastrointestinal tract.

5.3 **Treatment for Exposure:** Get medical attention promptly for all exposures. INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting. SKIN OR EYES: flush with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD$_{50}$: 0.5 to 5 g/kg (rats)

5.7 **Late Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating, such that personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Full severe skin irritant; may cause burn and second degree burns after a few minutes of contact.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** (Glacial) 68°F (C.C.)
6.2 **Flammable Limits in Air:** (Tech.) 2.4% (V)
6.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, dry chemical or carbon dioxide.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
6.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated.
6.6 **Behavior in Fire:** May polymerize and explode.
6.7 **Ignition Temperature:** 438°F
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Normally stable but will not dot state
7.4 **Neutralizing Agents for Acids and Caustics:** Wash with water; rinse with sodium bicarbonate solution.
7.5 **Polymerization:** May react violently on contact with acids, iron salts, or at elevated temperatures and release high energy rapidly; may cause explosion under confinement.
7.6 **Inhibitor of Polymerization:** Monomethyl ether of hydroquinone (MEHQ) 200 ppm, phenothiazine (for tech grade) 1000 ppm, hydroquinone (0.1%), methylene blue (0.15%), N,N-di-sec-butyl-p-phenylenediamine (0.05%).

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 30% 10 days
8.4 **Food Chain Concentration Potential:** None known

9. SELECTED MANUFACTURERS

1. Celanese Corporation
   Celanese Chemical Co. Division
   245 Park Ave.
   New York, N.Y. 10017
2. Rohm and Haas Co.
   Independence Mall West
   Philadelphia, Pa. 19105
3. Union Carbide Corp.
   Chemicals and Plastics Division
   270 Park Ave.
   New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 96% glacial 99.5%
10.2 **Storage Temperature:** 60° - 70°F
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

APQZ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive Material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicants	1
Aquatic Toxicants	3
Aesthetic Effect	2
Reactions	
Other Chemicals	2
Water	0
Self-Reaction	3

12.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 72.06
13.3 **Boiling Point at 1 atm:** 286°F = 141.3°C = 414.5°K
13.4 **Freezing Point:** 54.5°F = 12.5°C = 285.5°K
13.5 **Critical Temperature:** 545°F = 285°C = 558°K
13.6 **Critical Pressure:** 630 psia = 43 atm = 4.3 MN/m²
13.7 **Specific Gravity:** 1.049 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.22
13.12 **Latent Heat of Vaporization:** 272.5 Btu/lb (151 cal/g = 6.33 × 10⁵ J/kg)
13.13 **Heat of Combustion:** −9,100 Btu/lb = −5,060 cal/g = −21.2 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** −453 Btu/lb = −252 cal/g = −10.5 × 10⁵ J/kg

(Compare Liquids)

NOTES

REVISED 1978

ACN — ACRYLONITRILE

Common Synonyms

Watery liquid | Colorless to light yellow | Irritating odor

Floats on water | Poisonous flammable vapor is produced

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Isolate hazard area, deny entry
Cover liquid with plastic sheeting to reduce vaporization
Ventilate area
Dispose of by burning in approved incinerator equipped with afterburner and scrubber

2. LABELS





3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cyanoethylene
Fumigran
Ventox
Vinylcyanide

3.2 **Coast Guard Compatibility Classification:** Substituted allyl

3.3 **Chemical Formula:** CH_2CHCN

3.4 **IMCO United Nations Numerical Designation:** 1093

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild pungent odor. Odor threshold is 17 ppm

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear supplied mask, hood or coveralls in combination with supplied air mask for concentrations in low ppm range. For concentrations less than 25 ppm wear rubber or plastic gloves, chemical goggles or face mask, rubber boots, shaker suit or apron.

5.2 **Symptoms Following Exposure:** Symptoms of high concentration exposure: Vapor irritating to eyes, mucous membranes and respiratory tract. Headache, sneezing, abdominal pain, and vomiting. Nausea, weakness, dizziness, and collapse may follow. Liquid or vapor absorbed through the skin may cause irritation and redness of skin and eyes. Liquid may cause severe irritation and damage to eyes. Ingestion produces nausea, vomiting and abdominal pain.

5.3 **Treatment for Exposure:** Standard medical treatment is recommended for all routes of exposure.
INHALATION: Remove victim to fresh air. Keep victim warm and quiet. Administer oxygen if breathing is difficult. Give artificial respiration if victim is not breathing.
INGESTION: Induce vomiting by having victim drink two glasses of water and then touching back of throat with finger. Never induce vomiting or give anything by mouth to an unconscious person. Call physician immediately.
SKIN: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse.
EYES: Immediately flush eyes with plenty of water for at least 15 minutes, then get prompt medical attention.
Do not store or consume food, beverages or tobacco products where this material is handled, processed or stored. Wash thoroughly after handling. Remove and wash contaminated clothing promptly. Educate employees about hazards, precautions, first aid procedures, personal protection and sanitation practices.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 20 ppm

5.5 **Short-Term Inhalation Limits:** 40 ppm for 30 minutes

5.6 **Toxicity by Ingestion:** Grade 3 LD$_{50}$ = 93 mg/kg

5.7 **Late Toxicity:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 30°F C.C. 0°C

6.2 **Flammable Limits in Air:** 3.0% - 17.0%

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** When heated to decomposition ACN may emit poisonous fumes of cyanide and oxides of nitrogen

6.6 **Behavior in Fire:** Vapor is heavier than air and travels a considerable distance to source of ignition and flash back. May explode in fire and explode

6.7 **Ignition Temperature:** 898°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Mixtures of acrylonitrile and copper alloys (brass, monel, etc.) should not be used. Peroxides, caustics, ammonia, and other amines should be destroyed. Mixtures with sulfuric acid, nitric acid, oleum, sulfur trioxide, and chlorosulfonic acid may polymerize violently.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** May occur spontaneously in absence of oxygen or air saturated with water, especially when in contact with the products of alkali. Pure ACN, when stored in glass containers and exposed to light, may polymerize with rapid pressure development. The polymer or products may be hazardous and may explode. See section 10.

7.6 **Inhibitor of Polymerization:** Methylhydroquinone (35-45 ppm)

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 48 ppm 24 hr at the 50% kill point in fresh water
0.05 ppm 24 hr threshold lethal limit in salt water

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** Not known

8.4 **Food Chain Concentration Potential:** Not indicated

9 SELECTED MANUFACTURERS

E. I. du Pont de Nemours & Co., Inc.
Fabrichem Division
Wilmington, Delaware

Monsanto Co.
Monsanto Polymers & Petrochemicals Co.
800 North Lindbergh Blvd.
St. Louis, Missouri

Union Carbide Corp.
Chemicals & Plastics
270 Park Avenue
New York, New York

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, 99.0% min.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

VAPOR/SOL

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	
Poisons	3
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 53.06

13.3 **Boiling Point at 1 atm:** 171°F = 77°C = 350°K

13.4 **Freezing Point:** -13°F = -25°C = 248°K

13.5 **Critical Temperature:** 366°F = 241°C = 514°K

13.6 **Critical Pressure:** 710 psia = 48 atm = 4.8 MN/m²

13.7 **Specific Gravity:** 0.806 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 28 dynes/cm

13.9 **Liquid-Water Interfacial Tension:** Not known

13.10 **Vapor (Gas) Specific Gravity:** 1.8

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.4

13.12 **Latent Heat of Vaporization:** 265 Btu/lb = 147 cal/g = 6.15 x 10⁸ J/kg

13.13 **Heat of Combustion:** -14,300 Btu/lb = -7930 cal/g = -332 x 10⁸ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next card

5. HEALTH HAZARDS (Cont'd.)

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not readily tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** If spilled on clothing and allowed to remain in contact, smarting and reddening of the skin. Large amounts may be absorbed through the skin and cause poisoning.

5.10 **Odor Threshold:** 21 ppm (vapor of chemical purity)

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ADIPIC ACID

ADA

Common Synonyms	Solid crystals	White	Odorless
Adipic acid 1,4-Butanedicarboxylic acid Hexanedioic acid	Sinks and mixes slowly with water		

Fire

Combustible
Dust cloud may explode if ignited in an enclosed area

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.

SOLID
Irritating to skin and eyes.
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if entire water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Adipic acid
1,4-Butanedicarboxylic acid
Hexanedioic acid

3.2 **Coast Guard Compatibility Classification:** Data not available

3.3 **Chemical Formula:** HOOC(CH$_2$)$_4$COOH

3.4 **IMCO/UN Regulations Numerical Designation:** Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Crystalline

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Normal protection against exposure is finely divided organic solids (rubber gloves, plastic goggles)

5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membranes of the nose and throat, causes coughing and sneezing. Contact with liquid irritates eyes and has a pronounced drying effect on the skin. May produce dermatitis.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, get medical attention if irritation persists. EYES: flush with water for at least 15 min. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 Oral mouse LD_{50} = 1 900 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Combustible solid
401°F (C.C.) 196°C (C.C.)

6.2 **Flammable Limits in Air:** Data not available
10.15 mg/l

6.3 **Fire Extinguishing Agents:** Foam, water fog, carbon dioxide or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Melts and may decompose to give volatile acids, vapors of valeric acid and other substances. Dust may form explosive mixture with air

6.7 **Ignition Temperature:** 880°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Not pertinent

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Rinse with dilute sodium bicarbonate or soda ash solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** <330 ppm, 24 hr, Sheepshead Minnow, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Theoretically 1.35, 0.5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Chemical Corp.
A Division of Celanese Corp.
245 Park Avenue
New York, N.Y. 10017

2. E.I. duPont de Nemours & Co., Inc.
1007 Market St.
Wilmington, Del. 19898

3. Monsanto Company
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial, 99.8%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

NS II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 146.1

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:**
304°F = 151°C = 424°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.36 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** -6 242 Btu/lb = -4,579 cal/g = -191.6 x 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 1 and 4)

NOTES

ADN — ADIPONITRILE

Common Synonyms			
1,4-Dicyanobutane	Liquid	Colorless to light yellow	Odorless
	Floats on water. Freezing point is 36° F		

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Vapor may explode if ignited in an enclosed area

Exposure

LIQUID OR SOLID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook. CG 446-4)

Issue warning: poison, water contaminant
Mechanical containment
Should be removed

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** 1,4-Dicyanobutane
3 2 **Coast Guard Compatibility Classification:** Nitrile
3 3 **Chemical Formula.** $C_6H_8N_2$
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Water white to light yellow
4 3 **Odor:** Practically odorless

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Rubber gloves and clothing giving full body and face protection to avoid contact with skin. Air or oxygen mask.

5 2 **Symptoms Following Exposure.** Ingestion of a few ml may cause weakness, mental confusion, vomiting, rapid respiration, and tachycardia and convulsions. Headache and convulsions can result from exposure to vapor.

5 3 **Treatment for Exposure.** Symptomatic treatment. Cell physician. Thiosulfate should be considered. Administer vapor or amyl nitrite if patient is unconscious.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 50 ppm

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors can cause slight smarting of the eyes or respiratory system and may also cause more severe symptoms such as headache and convulsions.

5 9 **Liquid or Solid Irritant Characteristics.** If spilled on clothing and allowed to remain may cause smarting and reddening of the skin. If absorbed by skin may cause more severe symptoms such as headache and convulsions.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 199°F O.C.
6 2 **Flammable Limits in Air:** LFL = 1.0% at 200°C
6 3 **Fire Extinguishing Agents.** Water spray, dry chemical, foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic gases are generated in fire.
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature.** Data not available
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate.** 2.7 mm/min.

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 1250 ppm 24 hr sunfish TL_m fresh water
8 2 **Waterfowl Toxicity.** Data not available.
8 3 **Biological Oxygen Demand (BOD).** 40% 5 days
8 4 **Food Chain Concentration Potential.** Data not available

9 SELECTED MANUFACTURERS

1 Celanese Corporation
Celanese Chemical Co. Division
245 Park Ave.
New York, N.Y. 10017

2 E.I. duPont de Nemours Inc.
Plastics Department
DuPont Building
Wilmington, Del. 19898

3 Monsanto Company
Monsanto Textiles Co.
800 N. Lindbergh Blvd.
St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity.** Data not available
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook. CG 446-3)

A-1-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self-Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight.** 108
13 3 **Boiling Point at 1 atm.** 554°F = 290°C = 563°K
13 4 **Freezing Point.** 36°F = 2.4°C = 275.5°K
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity.** 0.9611 at 25°C (liquid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization.** (est.) 240 Btu/lb = 134 cal/g = 5.59 × 10⁵ J/kg
13 13 **Heat of Combustion.** -14,230 Btu/lb = -7910 cal/g = -331 × 10⁵ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6.

NOTES

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ALD — ALDRIN

Common Synonyms			
1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo-exo-5,8-dimethanonaphthalene	Solid crystals or solution	Light to dark brown	Mild chemical odor
	Solid sinks in water; solution floats on water		

AVOID CONTACT WITH LIQUID OR SOLID. KEEP PEOPLE AWAY.
Wear goggles; self-contained breathing apparatus; and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department if water has been discharged.
Inform local health and pollution control agencies.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

Fire

Solid is not flammable but usually is dissolved in a combustible liquid.
POISONOUS GASES ARE PRODUCED WHEN HEATED.
Wear goggles; self-contained breathing apparatus; and rubber overclothing (including gloves).
Extinguish with water, dry chemical, foam or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.
SOLID OR SOLUTION.
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Irritating to skin, eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have vomiting induced.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning; poison, water contaminant; liquid forms are flammable.
Mechanical containment (of liquid form) should be removed.

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.**
endo-exo-1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-dimethanonaphthalene
HHDN

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $C_{12}H_8Cl_6$

3 4 **IMCO/United Nations Numerical Designation** 6/1542

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Tan to dark brown

4 3 **Odor:** Mild chemical

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** During prolonged exposure to mixing and loading operations wear clean synthetic rubber gloves and mask or respirator of the type passed by the U.S. Bureau of Mines for aldrin protection.

5 2 **Symptoms Following Exposure:** Ingestion, inhalation, or skin absorption of a toxic dose will induce nausea, vomiting, hyperexcitability, tremors, epileptiform convulsions, and ventricular fibrillation. Aldrin may cause temporary reversible kidney and liver injury. Symptoms may be seen after ingestion of less than 1 gram in an adult; ingestion of 25 mg has caused death in children.

5 3 **Treatment for Exposure:** SKIN CONTACT: Wash with soap and running water. If material gets into eyes, wash immediately with running water for at least 15 minutes; get medical attention. INGESTION: Call physician immediately; induce vomiting immediately. Repeat until vomit fluid is clear. Never give anything by mouth to an unconscious person. Keep patient prone and quiet. PHYSICIAN: administer barbiturates, intravenously; anticonvulsant therapy. Observe patient carefully because repeated treatment may be necessary.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.25 mg/m³

5 5 **Short-Term Inhalation Limits:** 1 mg/m³ for 30 min

5 6 **Toxicity by Ingestion** (grade 3; LD50 to 500 mg/kg (rat))

5 7 **Late Toxicity:** Chronic exposure produces benign tumors in mice.

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. Effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air.** Not pertinent

6 3 **Fire Extinguishing Agents.** Water spray, dry chemical, foam or carbon dioxide for fires involving solutions of aldrin in hydrocarbon solvents

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating fumes of hydrochloric acid and chlorinated decomposition products are given off.

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.130 ppm, 24 hr, bluegill, LC, fresh water
0.05 ppm, 24 hr, goldfish, LC, fresh water
0.01 ppm, 24 hr, oyster, sublethal effect, salt water

8 2 **Waterfowl Toxicity:** 520 mg/kg

8 3 **Biological Oxygen Demand (BOD):** Not pertinent

8 4 **Food Chain Concentration Potential.** High

9. SELECTED MANUFACTURERS

Shell Chemical Co.
Agricultural Div.
2401 Crow Canyon Rd.
San Ramon, Calif. 94583

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 20-95% aldrin, 5-80% inert ingredients. Several solutions in hydrocarbon solvents.

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

1 1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	4
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 364.93

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** 219°F = 104°C = 377°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.6 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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ABS — ALKYLBENZENESULFONIC ACIDS

Common Synonyms
Decylbenzen sulfonic acid
Un
Do
In
Tetra
Penta
Hexa
} benzenesulfonic acid

Liquid | White to yellow | Odorless

Mixes with water

[illegible] of pressure [illegible]
oil/gas deposition
[illegible]
[illegible]
Notify local health and pollution [illegible] authorities

Fire

Combustible
Flammable gas may be produced on contact with metals
[illegible]
Water spray [illegible]

Exposure

SET FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
If swallowed will cause nausea
[illegible]
EYES: [illegible]
SKIN: [illegible]
INGESTION: [illegible] drink water
[illegible]
[illegible] INCOMPATIBLES OR HAVING CONTACT WITH [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate [illegible]
Disperse and flush

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Un
Do
In
Tetra
Penta
Hexa
} decylbenzenesulfonic acid

3 2 **Coast Guard Compatibility Classification**
Not listed

Continued on page 4

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color** Colorless to yellow
4 3 **Odor.** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure** Ingestion causes irritation of mouth and stomach. Contact with liquid irritates eyes and skin
5 3 **Treatment for Exposure** INGESTION: give large amount of water. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 2, LD50 0.5 g/kg (rat)
5 7 **Late Toxicity.** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 395 °F C
6 2 **Flammable Limits in Air**
Data not available
6 3 **Fire Extinguishing Agents** Alcohol foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:**
Water may be ineffective
6 5 **Special Hazards of Combustion Products.**
Irritating sulfuric acid mist may form in fire
6 6 **Behavior in Fire**
6 7 **Ignition Temperature** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** May attack metals causing accumulation of flammable hydrogen gas in enclosed spaces
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Flush with water, rinse with dilute sodium bicarbonate or soda ash solution
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)**
Data not available
8 4 **Food Chain Concentration Potential.**
None

9. SELECTED MANUFACTURERS

1 Continental Oil Co
Petrochemical Dept
Park 80 Plaza East
Saddle Brook, N J 07662

2 Witco Chemical Co
Organics Div
277 Park Avenue
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial 88% 97%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.**
Liquid
13 2 **Molecular Weight:** 310 - 394
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** Data not available
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 1.0 to 1.4 at 20°C (liquid)
13 8 **Liquid Surface Tension**
Data not available
13 9 **Liquid-Water Interfacial Tension**
Not pertinent
13 10 **Vapor (Gas) Specific Gravity**
Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent
13 12 **Latent Heat of Vaporization**
Not pertinent
13 13 **Heat of Combustion.** Data not available
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Data not available
13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

5 HEALTH HAZARDS (Cont'd)

3 3 **Chemical Formula:**
$C_nH_{n+1}C_6H_4SO_3H$ (n = 10–16)
3 4 **IMCO/United Nations Numerical Designation.** Not listed

ALLYL ALCOHOL

ALA

Common Synonyms
Vinyl carbinol
2-Propen-1-ol

Watery liquid | Colorless | Sharp mustard odor

Floats and mixes with water | Poisonous, flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
Shut off ignition sources and call fire department
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves)
Stop discharge if possible
Stay upwind and use water spray to knock down vapor
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves)
Extinguish with dry chemical, alcohol foam, carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes, nose and throat

Move to fresh air
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

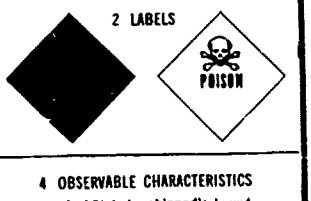
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability, poison
Restrict access
Disperse and flush

2 LABELS



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
2 Propen 1-ol
Vinylcarbinol

3 2 **Coast Guard Compatibility Classification:**
Substituted allyl

3 3 **Chemical Formula:** $CH_2=CHCH_2OH$

3 4 **IMCO/United Nations Numerical Designation.** 3 2 1098

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Characteristic pungent sharp causes tears

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Organic canister or air pack, rubber gloves, goggles, other protective equipment as required to prevent all body contact

5 2 **Symptoms Following Exposure:** Vapors are quite irritating to eyes, nose and throat. Excessive exposure may be accompanied by complaints of photophobia and pain in the eyeball; pain may not begin until 1 to 4 hours after exposure. Liquid may cause first- and second-degree burns of the skin with blister formation; underlying part will become swollen and painful, and local muscle spasms may occur

5 3 **Treatment for Exposure:** INHALATION: remove victim from contaminated area and administer oxygen; get medical attention immediately. SKIN: remove liquid with soap and water. EYES: flush with continuous stream of water for 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 2 ppm

5 5 **Short-Term Inhalation Limits:** 5 ppm for 30 min

5 6 **Toxicity by Ingestion.** Grade 3 LD$_{50}$ 50 to 500 mg/kg (mouse, rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure

5 10 **Odor Threshold:** 0.78 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 72°F C.C., 90°F O.C.

6 2 **Flammable Limits in Air:**
2.5% - 18%

6 3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**
Water may be ineffective

6 5 **Special Hazards of Combustion Products.**
Toxic vapors are generated when heated

6 6 **Behavior in Fire:** Vapor heavier than air and may travel a considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** 829°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 2.7 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable at ordinary temperatures and pressures

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.**
10 ppm/*/threshold/fresh water
2.5 ppm/*/bivalve larvae/lethal/salt water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):**
57% 10 days, 20% 5 days

8 4 **Food Chain Concentration Potential**
None noted

9 SELECTED MANUFACTURERS

1 FMC Corp
Organic Chemicals Div
633 Third Ave
New York, N.Y. 10017

2 Olin Corp
Chemicals Div
Brandenburg, Ky. 40108

3 Shell Chemical Co
Industrial Chemicals Div
Houston, Texas 77001

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 98%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Flammable Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 58.08

13 3 **Boiling Point at 1 atm:**
206°F = 96.9°C = 370.1°K

13 4 **Freezing Point:**
-200°F = -129°C = 144°K

13 5 **Critical Temperature:**
521.4°F = 271.9°C = 545.1°K

13 6 **Critical Pressure.**
840 psia = 57 atm = 5.8 MN/m^2

13 7 **Specific Gravity:** 0.852 at 20°C (liquid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension.**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 2.0

13 11 **Ratio of Specific Heats of Vapor (Gas)**
1.12

13 12 **Latent Heat of Vaporization.**
295 Btu/lb = 164 cal/g = 6.87 × 10^5 J/kg

13 13 **Heat of Combustion:** -13,720 Btu/lb
= -7620 cal/g = -319.0 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (est.) Negligible

13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

ABR

ALLYL BROMIDE

Common Synonyms
3-bromopropene
Bromallylene
3-bromopropylene

Liquid | Colorless to light yellow | Irritating odor

Sinks in water. Flammable, irritating vapor is produced

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness, coughing or difficult breathing

LIQUID
Irritating to skin and eyes

Water Pollution

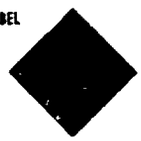
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bromallylene
3-Bromopropene
3-Bromopropylene

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_2 = CH \cdot CH_2Br$

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1099

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to light yellow

4.3 **Odor:** Irritating, unpleasant, pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles and face shield, protective clothing, self-contained breathing apparatus for high vapor concentrations

5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membranes and causes dizziness, headache, and lung irritation. Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach

5.3 **Treatment for Exposure:** INHALATION: remove from exposure, if breathing is difficult, give oxygen, call physician. EYES: flush with water for at least 15 min, and call physician. SKIN: flush with water, get medical attention for skin irritation. INGESTION: do NOT induce vomiting, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 30 mg/kg (guinea pig)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes' contact

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 30°F C.C.

6.2 **Flammable Limits in Air:** 4.4% - 7.3%

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Toxic hydrogen bromide gas formed in fire

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 563°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 White Chemical Corporation
East 22nd Street
Box 278
Bayonne, N. J. 07002

2 American Hoechst Corporation
Chemicals and Plastics Division
Somerville, N. J. 08876

3 Columbia Organic Chemical Co.
912 Drake St.
Columbia, S. C. 29205

10. SHIPPING FORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A.X.-1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self-Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 121

13.3 **Boiling Point at 1 atm:** 158°F = 70°C = 343°K

13.4 **Freezing Point:** −182°F = −119°C = 154°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.4161 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 26.9 dynes/cm = 0.0269 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4.2

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.210

13.12 **Latent Heat of Vaporization:** (est.) 110 Btu/lb = 59 cal/g = 2.5 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) 6,700 Btu/lb = 3,700 cal/g = 150 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 4 am.)

NOTES

ALC

ALLYL CHLORIDE

Common Synonyms
3-Chloropropene
3-Chloropropylene

Liquid Colorless to yellowish brown Sharp irritating odor or red

Floats on water Flammable irritating vapor is produced

Avoid contact with liquid and vapor. Keep people away.
Stop leak if safe to do so. Dike and collect liquid.
Water spray may be useful in controlling vapors.
Small amounts of liquid spills may be absorbed into paper towels and evaporated in a fume hood.
Do not flush to sewer or allow to enter waterways.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Dry agents, sand, earth, foam, water fog or spray may be used to fight fire.
Avoid water stream. It may scatter and spread fire.
Use water spray to cool fire-exposed containers.

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes, nose and throat.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes
Keep victim quiet and warm.
Flush eyes with plenty of water.
IF IN EYES: Hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim CONSCIOUS: Induce vomiting; drink water or milk.
IF SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS: Do not induce vomiting.
Keep victim warm and quiet.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Isolate hazard area.
Keep unauthorized personnel away.
Stay upwind.
Keep out of low areas.
Ventilate closed spaces before entering.
Water spray may be useful in controlling vapors.
Small amounts of liquid spills may be absorbed into paper towels and evaporated in a fume hood.
Do not flush to sewer or allow to enter waterways.
Notify local health and pollution control agencies.

2 LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms**
3-Chloropropene
3-Chloropropylene

3.2 **Coast Guard Compatibility Classification**
Substituted allyl

3.3 **Chemical Formula** CH_2CHCH_2Cl

3.4 **IMCO United Nations Numerical Designation.** 3.1 1100

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless to yellowish brown or red

4.3 **Odor** Sharp pungent irritating characteristic pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Respiratory protection: Up to 2 ppm: chemical cartridge full face mask and canister (greater concentrations) self-contained breathing apparatus or its equivalent. Rubber or neoprene gloves, apron, boots, clean body covering clothes, chemical goggles, gas-tight goggles or equivalent, full face shield.

5.2 **Symptoms Following Exposure** Causes irritation of eyes, nose and throat. Breathing effects may be delayed.

5.3 **Treatment of Exposure:** INHALATION: if all effects disappear, no further treatment necessary. Keep warm and quiet. Get medical attention immediately. Start artificial respiration if breathing stops. INGESTION: prompts induce vomiting. Get medical attention immediately. No known antidote, treat symptoms. Call. EYES: immediately flush with plenty of water for at least 15 min. get medical attention. prompts. SKIN: remove clothing and flush affected area thoroughly.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 1 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 = 0.8 g/kg (rat)

5.7 **Late Toxicity:** Lung, liver and kidney damage in experimental animals

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is moderately irritating, causing tearing, burning, inflammation; usually tolerate moderate, higher vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Causes severe irritation of the skin and eyes; can be absorbed in harmful amounts. Prolonged exposure and may cause secondary burns on. Long exposure.

5.10 **Odor Threshold** 0.47 ppm

6 FIRE HAZARDS

6.1 **Flash Point** -20°F (-29°C)

6.2 **Flammable Limits in Air**
2.9% to 11.1%

6.3 **Fire Extinguishing Agents**
Foam, dry chemical, carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used**
Water jet.

6.5 **Special Hazards of Combustion Products**
Reacts with strong hydroxides, alkali metals, amines, oxidizing agents.

6.6 **Behavior in Fire.** Not reported

6.7 **Ignition Temperature.** 459°F (237°C)

6.8 **Electrical Hazard** Not reported

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not reported

7.5 **Polymerization** Not reported

7.6 **Inhibitor of Polymerization**
Not reported

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
48 ppm 96 hr/copepod/Harbor Water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential**
None noted

9 SELECTED MANUFACTURERS

Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

2. Dow Chemical Co.
Midland, Michigan 48640

Eastman Kodak Co.
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 448-2

ATUVW

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poison	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactions	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 76.53

13.3 **Boiling Point at 1 atm**
113°F = 45°C = 318°K

13.4 **Freezing Point**
-72°F = -58°C = 215°K

13.5 **Critical Temperature**
460°F = 238°C = 511°K

13.6 **Critical Pressure**
(extrapolated) 47 atm = 4.8 MN/m²

13.7 **Specific Gravity:** 0.939 at 20°C (liquid)

13.8 **Liquid Surface Tension**
24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.**
Data not available

13.10 **Vapor (Gas) Specific Gravity:** 2.6

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.24

13.12 **Latent Heat of Vaporization:**
Data not available

13.13 **Heat of Combustion** -14749 Btu/lb
= -5481 cal/g = -229 kJ/g

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(Continued on next page)

NOTES

REVISED 1978

ACF	# ALLYL CHLOROFORMATE

Common Synonyms
Allyl chlorocarbonate

Watery liquid Colorless Extremely irritating odor

Sinks in water. Flammable irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause difficult breathing.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

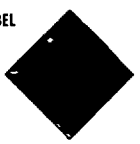
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning, as appropriate.
Restrict access.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Allyl chlorocarbonate

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula** $CH_2=CH-CH_2-O-COCl$

3.4 **IMCO/United Nations Numerical Designation:** 1722

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Extremely irritating causes tears; pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Vapor proof protective goggles and face shield; plastic or rubber gloves, shoes and clothing; gas mask or self-contained breathing apparatus.

5.2 **Symptoms Following Exposure.** Vapor irritates eyes and respiratory tract. Contact with liquid causes eye and skin irritation and necrosis; irritates mouth and stomach.

5.3 **Treatment for Exposure.** INHALATION: remove from exposure, support respiration if necessary, call physician. EYES: if contacted, flush with vapor or liquid; flush with water for at least 15 min. SKIN: wash with large amounts of water for at least 15 min. INGESTION: do NOT induce vomiting, give water, call physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available.

5.5 **Short-Term Inhalation Limits.** Data not available.

5.6 **Toxicity by Ingestion:** Grade 3. LD$_{50}$: 500–5000 mg/kg.

5.7 **Late Toxicity:** Data not available.

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is severely irritating such that persons will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Liquid is severely irritant. May cause pain, reddening, second degree burns after a few minutes contact.

5.10 **Odor Threshold.** 1.4 ppm.

6 FIRE HAZARDS

6.1 **Flash Point.** 92°F (O.C.), 88°F (C.C.)

6.2 **Flammable Limits in Air.** Data not available.

6.3 **Fire Extinguishing Agents.** Dry chemical, foam, carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective.

6.5 **Special Hazards of Combustion Products.** When heated to decomposition, emits highly toxic, phosgene gas.

6.6 **Behavior in Fire.** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.

6.7 **Ignition Temperature.** Data not available.

6.8 **Electrical Hazard.** Data not available.

6.9 **Burning Rate.** 4 mm/min. (est.)

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly, generating hydrogen chloride.

7.2 **Reactivity with Common Materials.** Corrodes metals.

7.3 **Stability During Transport:** Stable.

7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with lime or sodium bicarbonate solution.

7.5 **Polymerization.** Not pertinent.

7.6 **Inhibitor of Polymerization.** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD).** Data not available.

8.4 **Food Chain Concentration Potential.** None.

9 SELECTED MANUFACTURERS

1. Chemetron Corporation
   Organic Chemicals Division
   345 Seventh Avenue
   New York, N.Y. 10001
2. Orr Chemical Co.
   5825 Agard Rd.
   Muskegon, Mich. 49442
3. Polysciences, Inc.
   Paul Valles Industrial Park
   Warrington, Pa. 18976

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial 97%

10.2 **Storage Temperature:** Keep cool.

10.3 **Inert Atmosphere.** No requirement.

10.4 **Venting:** Pressure vacuum.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

VOXY

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Corrosive; Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicants	2
Aquatic Toxicants	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 120.5

13.3 **Boiling Point at 1 atm:** 113°F = 45°C = 318°K

13.4 **Freezing Point.** −112°F = −80°C = 193°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 1.139 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.** Not pertinent.

13.10 **Vapor (Gas) Specific Gravity:** 4.15

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0504

13.12 **Latent Heat of Vaporization** (est.) 100 Btu/lb = 56 cal/g = 2.3 × 10^5 J/kg

13.13 **Heat of Combustion** (est.) −7,800 Btu/lb = −4,300 cal/g = −180 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent.

13.15 **Heat of Solution:** Not pertinent.

13.16 **Heat of Polymerization.** Not pertinent.

Continued on page 4 and 5

NOTES

ATC

ALLYLTRICHLOROSILANE

Common Synonyms
Allyltrichlorosilane trichloride

Liquid | Colorless | Sharp, irritating odor

Reacts violently with water. Irritating visible vapor cloud is produced.

Fire

Combustible.
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

VAPOR

Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.

LIQUID

Will burn skin and eyes.
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Alkylsilicone trichloride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_2{=}CH{-}CH_2{-}SiCl_3$

3.4 **IMCO/United Nations Numerical Designation:** 8.1724

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp pungent irritating like hydrochloric acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirators, protective rubber gloves, chemical goggles, other equipment necessary to protect skin and eyes

5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membranes. Liquid causes severe burns of eyes and skin and severe internal burns if ingested.

5.3 **Treatment for Exposure:** Get medical attention after all exposures to this compound. INHALATION: remove from exposure, support respiration. EYES: flush with water 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting, give water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, LD_{50} 50 to 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 100°F (O.C.), 95°F (C.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water

6.5 **Special Hazards of Combustion Products:** Irritating vapors of hydrogen chloride and phosgene may form

6.6 **Behavior in Fire:** Difficult to extinguish. Re-ignition may occur

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 2.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously generating hydrogen chloride (hydrochloric acid)

7.2 **Reactivity with Common Materials:** Corrodes metal because of hydrochloric acid formed

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640

2. Polysciences, Inc.
Paul Valley Industrial Park
Warrington, Pa. 18976

3. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A.O.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	4
Self Reaction	4

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 175.5

13.3 **Boiling Point at 1 atm:** 241°F = 116°C = 389°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.215 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 6

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0863

13.12 **Latent Heat of Vaporization:** 97 Btu/lb = 54 cal/g = 2.3×10^5 J/kg

13.13 **Heat of Combustion:** (est.) −5,200 Btu/lb = −2,900 cal/g = -120×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

ACL

ALUMINUM CHLORIDE

Common Synonyms Anhydrous aluminum chloride	Solid crystals or powder Yellow-orange to grayish-white Irritating odor Sinks in water Poisonous gas is produced on contact with water

[illegible]

Fire

Not flammable

[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
Harmful if inhaled

[illegible]

SOLID
Will burn skin and eyes
Harmful if swallowed

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-6)

Disperse and flush with care
Issue water for corrosive

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Anhydrous aluminum chloride

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $AlCl_3$

3 4 **IMCO United Nations Numerical Designation:** NO 1726

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Orange to yellow through gray to white

4 3 **Odor:** Like hydrogen chloride (like hydrochloric acid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** All personnel in the area should wear safety clothing, including fully closed goggles, rubber or plastic coated gloves, rubber shoes and overalls of a chemical resistant material. An acid vapor canister mask should be carried in case of emergency. In certain applications it may be advisable to wear this equipment in a standing base.

5 2 **Symptoms Following Exposure:** Contact with the skin or eyes in the presence of moisture causes thermal and acid burn

5 3 **Treatment for Exposure:** INGESTION: If victim is conscious have him drink water or milk. Do NOT induce vomiting. SKIN: flush immediately with plenty of water. For eye contact, flush with water for at least 15 mins. and get medical attention immediately

5 4 **Toxicity L_D Inhalation (Threshold Limit Value)** 5 ppm (hydrogen chloride)

5 5 **Short-Term Inhalation Limits:** 5 ppm for 5 min 50 ppm for 0 min 20 ppm for 20 min 10 ppm for 60 min (all for hydrogen chloride)

5 6 **Toxicity by Ingestion:** No systemic effects but severe burn of mouth

5 7 **Late Toxicity:** None recognized

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor of hydrogen chloride is moderately irritating and trained personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Has severe skin irritant may cause pain and second-degree burns after a few minutes contact

5 10 **Odor Threshold:** 1 5 ppm hydrogen chloride

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Reacts violently with water used in extinguishing adjacent fires

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently with water liberating hydrogen chloride gas and heat

7 2 **Reactivity with Common Materials:** None if dry If wet it attacks metals because of hydrochloric acid formed flammable hydrogen is formed

7 3 **Stability During Transport:** Stable if kept dry and protected from atmospheric moisture

7 4 **Neutralizing Agents for Acids and Caustics:** Hydrochloric acid formed by reaction with water can be flushed away with water Rinse with sodium bicarbonate or lime solution

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Not pertinent

8 2 **Waterfowl Toxicity:** Not pertinent

8 3 **Biological Oxygen Demand (BOD)** Not pertinent

8 4 **Food Chain Concentration Potential.** Not pertinent

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Division
Morristown, N J 07960

2 Pearsall Corp
Pearsall Chemical Co Div
4635 Southwest Freeway
Houston, Texas 77027

3 Stauffer Chemical Co
Industrial Chemical Div
Baton Rouge, La 70821

10 SHIPPING INFORMATION

*10 1 **Grades or Purity:** Pure 99 7% technical 99 5

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

RRC

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 133 34

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 2 44 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

*13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

*13 16 **Heat of Polymerization** Not pertinent

Continued on next sheet

NOTES

ALF	ALUMINUM FLUORIDE

Common Synonyms

Solid powder or granules White Odorless

Sinks in water

Fire

Not Flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
If inhaled irritating to nose and throat

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-6

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification
3.3 Chemical Formula
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color
4.3 Odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits
5.6 Toxicity by Ingestion LD_{50} = 600 mg/kg (Guinea pig)
5.7 Late Toxicity: Skeletal fluorosis (bone abnormalities in humans working in aluminum plant for 12 years
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature
6.8 Electrical Hazard
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water
7.2 Reactivity with Common Materials:
7.3 Stability During Transport
7.4 Neutralizing Agents for Acids and Caustics
7.5 Polymerization
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity
10.2 Storage Temperature
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

1

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
Not Listed
12.2 NAS Hazard Rating for Bulk Water Transportation: Not Listed
12.3 NFPA Hazard Classifications

Category	Classification
Health Hazard	
Flammability	
Reactivity (Oxidation)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm
13.2 Molecular Weight
13.3 Boiling Point at 1 atm
13.4 Freezing Point
13.5 Critical Temperature
13.6 Critical Pressure
13.7 Specific Gravity
13.8 Liquid Surface Tension
13.9 Liquid-Water Interfacial Tension
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization
13.13 Heat of Combustion:
13.14 Heat of Decomposition
13.15 Heat of Solution
13.16 Heat of Polymerization:

NOTES

REVISED 1978

ALN — ALUMINUM NITRATE

Common Synonyms	Solid	White	Odorless
Aluminum nitrate nonahydrate Nitric acid, aluminum salt	Sinks and mixes slowly with water		

Fire

Not Flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
Harmful if inhaled

SOLID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Dispersant: Dash

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms
3.2 Coast Guard Compatibility Classification
3.3 Chemical Formula: $Al(NO_3)_3 \cdot 9H_2O$
3.4 IMCO/United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: White
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics: Flush with water
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
96 per 10 days at Mississippi River killed fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD):
None
8.4 Food Chain Concentration Potential:

9. SELECTED MANUFACTURERS

Mallinckrodt Chemical Works
223 Wegonde Ave
P O Box 5439
Jersey City, N J 07305

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown, N J 07960

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10. SHIPPING INFORMATION

*10.1 Grades of Purity: Reagent, USP, Technical
*10.2 Storage Temperature:
*10.3 Inert Atmosphere:
*10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

SS

12. HAZARD CLASSIFICATIONS

*12.1 Code of Federal Regulations:
Oxidizer
12.2 NAS Hazard Rating for Bulk Water Transportation:
*12.3 NFPA Hazard Classifications:

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
Solid
13.2 Molecular Weight:
*13.3 Boiling Point at 1 atm:
*13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
*13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
*13.11 Ratio of Specific Heats of Vapor (Gas):
*13.12 Latent Heat of Vaporization:
*13.13 Heat of Combustion:
*13.14 Heat of Decomposition:
*13.15 Heat of Solution:
*13.16 Heat of Polymerization:

Continued on page [illegible]

NOTES

ALM

ALUMINUM SULFATE

Common Synonyms
Cake alumnum
Patent alumnum

Solid | Gray white | Odorless

Sinks and mixes slowly with water

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
[illegible]

Fire

Not flammable

[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting
[illegible]

IF SWALLOWED [illegible] DO NOT INDUCE VOMITING FOR SOLID OR IF VICTIM IS DROWSY OR CONVULSING

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cake alum
Patent alum

3 2 **Coast Guard Compatibility Classification:** Not Listed

3 3 **Chemical Formula:** $Al_2(SO_4)_3 \cdot 18H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not Listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Gray white

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and mouth. Ingestion of large doses causes gastric irritation, nausea, vomiting and purging. Dust irritates eyes and skin.

5 3 **Treatment for Exposure:** INHALATION: rinse nose and mouth with water. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2; oral mouse LD_{50} = 770 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May corrode metals in presence of moisture

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
[illegible]
240ppm 48 hr nonagitated TL$_m$ *
*Water is presumed

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Div
Morristown, N J 07960

2 American Cyanamid Co
Industrial Chemicals and Plastics Div
Wayne, N J 07470

3 W R Grace & Co
Davison Chemicals Div
Baltimore, Md 21203

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at * atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 * at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** -22.1 Btu/lb
= -12.3 cal/g = -0.515 × 10^3 J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page * and *

NOTES

AEA AMINOETHYLETHANOLAMINE

Common Synonyms
N-(2-Aminoethyl)-ethanolamine
2-[(2-Aminoethyl)amino] ethanol
N-(2-Hydroxyethyl)-ethylenediamine
N-Hydroxyethyl-2-ethanediamine

Liquid | Colorless | Mild ammonia odor

Sinks and mixes with water

Fire

Combustible

Exposure

LIQUID
Will burn skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Dispersal and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
2-(2-Aminoethylamino)ethanol
N-(2-Aminoethyl)ethanolamine
N-beta-Hydroxyethylethylenediamine
N-Hydroxyethyl-2-ethanediamine

3.2 **Coast Guard Compatibility Classification:**
Miscellaneous

3.3 **Chemical Formula:**
$HOCH_2CH_2NHCH_2CH_2NH_2$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild ammonia-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, protective clothing

5.2 **Symptoms Following Exposure:** Skin contact will cause irritation; eye contact will cause more severe irritation

5.3 **Treatment for Exposure:** INGESTION: do NOT induce vomiting; call physician immediately. SKIN: wash area with plenty of water. EYES: flush thoroughly with running water (preferably for 15 min)

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; LD$_{50}$ 0.5 to 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** High concentrations of vapor may cause a slight smarting of the eyes or respiratory system. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes severe skin irritation; may cause pain and second-degree burns after a few minutes' contact.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 200°F (93°C) OC

6.2 **Flammable Limits in Air:**
Not applicable

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 690°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

2. Jefferson Chemical Co.
1121 Richmond Ave.
Houston, Tex. 77002

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 104.15

13.3 **Boiling Point at 1 atm:**
460°F = 238°C = 511°K

13.4 **Freezing Point:** Data not available

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.020 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.053

13.12 **Latent Heat of Vaporization:**
(est.) At Boiling Point = 175 cal/g
= 7.33 × 10^8 J/kg

13.13 **Heat of Combustion:** (est.) -6 kcal/g
= -25,100 cal/g = -1.05 × 10^8 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:**
(est.) = 4 Btu/lb = 2 cal/g
= 8.37 × 10^3 J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

AMA	# AMMONIA, ANHYDROUS

Common Synonyms
Liquid Ammonia

Liquefied compressed gas Colorless Ammonia odor

Floats and boils on water. Poisonous vapor cloud is produced.

Fire

Combustible

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

LIQUID
Will burn skin and eyes
Harmful if swallowed
Will cause frostbite

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula: NH_3
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
2.0 2.5 ppm 14 days goldfish and
60 80 ppm 3 days crayfish TLC_{100}
2.2 ppm 96 hr fathead minnow TL_m
8.2 Water-out Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

A B C K L M N

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Health	
Flammability	
Reactivity	
Water Pollution	
Other	

12.3 NFPA Hazard Classifications

Category	Classification
Health Hazard	
Flammability	
Reactivity	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

REVISED 1978

AAT	# AMMONIUM ACETATE

Common Synonyms			
Acetic acid, ammonium salt	Solid	White	Weak ammonia odor
	Sinks and mixes with water		

[illegible]

Fire

Not flammable
Irritating gases may be produced when heated
[illegible]

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
[illegible]
SOLID
Irritating to skin and eyes
If swallowed will cause nausea
[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Acetic acid, ammonium salt
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula** $NH_4C_2H_3O_2$
3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color** White
4 3 **Odor** Weak ammoniacal

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust mask, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure** Inhalation of dust irritates nose and mouth. Ingestion irritates mouth and stomach. Contact with dust causes irritation of eyes and mild irritation of skin
5 3 **Treatment for Exposure:** INHALATION removes victim to fresh air, rinse nose and mouth with water. INGESTION give large amounts of water. EYES flush with water for at least 15 min. SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Irritating vapors of ammonia and acetic acid may form in fires
6 6 **Behavior in Fire**
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials**
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** [illegible] ppm 24 hr mosquito fish TL_m fresh water
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** 29% 15 days
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1057R
Morristown, N J 07960

2 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 284
Jersey City, N J 07303

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Reagent CP
Technical 97+%
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications** Not Listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight** [illegible]
13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)
13 4 **Freezing Point.** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity.** 1.17 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution** [illegible] Btu/lb = [illegible] cal/g = [illegible] $\times 10^3$ J/kg
13 16 **Heat of Polymerization** Not pertinent

Continued on page Sheet A

NOTES

ABZ

AMMONIUM BENZOATE

Common Synonyms
Benzoic acid, ammonium salt

Solid | White | Odorless

Sinks and mixes slowly with water

Fire

Combustible
Dust cloud may explode if ignited in an enclosed area
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
Harmful if inhaled

SOLID
Irritating to skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Benzoic acid ammonium salt
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula:** $C_6H_5COONH_4$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose Contact with eyes causes irritation
5 3 **Treatment for Exposure:** INHALATION move to uncontaminated atmosphere EYES flush with water for at least 15 min SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents.** Water foam dry chemical carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:**
6 5 **Special Hazards of Combustion Products:** Irritating toxic ammonia gas may form in fires
6 6 **Behavior in Fire**
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Slowly releases ammonia gas, which may collect in closed container
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Ashland Oil Inc
P O Box 2219
Columbus Ohio 43216

2 Heico Inc
Delaware Water Gap Pa 18327

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 139 15
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** 388°F = 198°C = 471°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 26 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** 34 Btu/lb = 19 cal/g = 0 80 x 10^3 J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ABC

AMMONIUM BICARBONATE

Common Synonyms
Acid ammonium carbonate
Ammonium hydrogen carbonate
Carbonic acid, monoammonium salt

Solid White Weak ammonia odor

Sinks and mixes slowly with water. Freezing point is 95°F

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Acid ammonium carbonate
Ammonium hydrogen carbonate
Carbonic acid, monoammonium salt

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** NH_4HCO_3

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Slight ammonia

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Work gloves, dust respirator, safety glasses or chemical safety goggles if dusty

5 2 **Symptoms Following Exposure:** Inhalation may cause respiratory irritation. Ingestion could be harmful. Contact with eyes or skin causes irritation.

5 3 **Treatment for Exposure:** Consult physician in case of ingestion or severe irritation. INHALATION: move to uncontaminated atmosphere. EYES OR SKIN: wash with large amounts of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Irritating and toxic ammonia gas may form in fires

6 6 **Behavior in Fire:** Decomposes but reaction is not explosive. Ammonia gas is formed

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May attack copper, nickel and zinc

7 3 **Stability During Transport:** Decomposes above 34°C (91°F) with formation of ammonia gas, which may collect in closed containers

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Diamond Shamrock Chemical Co
300 Union Commerce Building
Cleveland, Ohio 44115

2 Allied Chemical Corp
Industrial Chemicals Division
P O Box 1139P
Morristown, N J 07960

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Food, Reagent

10 2 **Storage Temperature:** Below 33°C (91°F)

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 79.06

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent (decomposes at 35°C)

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.57 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** 140 Btu/lb = 80 cal/g = 3.3×10^5 J/kg

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

ABF AMMONIUM BIFLUORIDE

Common Synonyms
Ammonium hydrogen fluoride
Acid ammonium fluoride
Ammonium acid fluoride

Solid — White — Odorless

Sinks and mixes with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Will burn skin and eyes.
If swallowed will cause nausea or vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - corrosive water contaminant
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.**
Acid ammonium fluoride
Ammonium acid fluoride
Ammonium hydrogen fluoride

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula** NH_4HF_2

3 4 **IMCO/United Nations Numerical Designation** 8127

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color** White

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Bu Mines approved respirator, rubber gloves, safety goggles

5 2 **Symptoms Following Exposure** Inhalation of gas may cause irritation of the respiratory system. Ingestion causes irritation of mouth and stomach, vomiting, abdominal pain, convulsions, collapse, acute toxic nephritis. Contact with dust irritates eyes and may cause burns; irritation or skin. High concentrations of fluorine in the urine have been reported following skin contact.

5 3 **Treatment for Exposure** *Begin first aid as quickly as possible.* INHALATION remove victim to fresh air, INGESTION perform gastric lavage with dilute water or 1% calcium chloride solution, support respiration, call physician. EYES flush with water for at least 15 min, consult physician. In SKIN flush with water, treat burns. OTHER remove all contaminated clothing in the shower at once.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 2.5 mg/m³ (as fluorine)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Grade 3, LD_{50} = 50 mg/kg (as rat) (see p. 60 for explanation)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Do not apply water to adjacent fires

6 5 **Special Hazards of Combustion Products** Toxic ammonia and hydrogen fluoride gases may form in fire

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Dissolves and forms a weak solution of hydrofluoric acid

7 2 **Reactivity with Common Materials.** In presence of moisture will corrode glass, cement and most metals. Flammable hydrogen gas may collect in enclosed spaces

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Division
Route 202-206 North
Somerville, N J 08876

2 The Harshaw Chemical Co
1945 E 97th Street
Cleveland, Ohio 44106

3 Allied Chemical Corp
Specialty Chemicals Division
P O Box 1057R
Morristown, N J 07960

10 SHIPPING INFORMATION

10 1 **Grades of Purity** Pure 99+%
Technical 97 - 98.5%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Corrosive solid

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight:** 57.04

13 3 **Boiling Point at 1 atm:**
463.1°F = 239.5°C = 512.7° K

13 4 **Freezing Point**
358.0°F = 125.6°C = 398.8° K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 1.52 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** 154 Btu lb
= 85.7 cal g = 3.59 × 10⁵ J kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

ACB

AMMONIUM CARBONATE

Common Synonyms

Solid White Strong Ammonia Odor

Sinks and mixes with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Hartshorn Salvolatile
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $(NH_4)_2CO_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** White
4 3 **Odor:** Strong ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator protection against ammonia vapors
5 2 **Symptoms following Exposure:** Inhalation causes irritation of nose and throat Ingestion may cause gastric irritation Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION leave contaminated area INGESTION give large amount of water EYES flush with copious amounts of water SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Strong ammonia odor

6 FIRE HAZARDS

6 1 **Flash Point** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic ammonia gas will form in fires
6 6 **Behavior in Fire** Decomposes but reaction is not explosive Ammonia gas is formed
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials**
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
24 ppm 3 5 hr goldfish killed fresh water
10 ppm > 10 hr Mosquito fish fresh water
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Agrico Chemical Co
National Bank of Tulsa Building
Tulsa Okla 74103

2 Allied Chemical Corp
Specialty Chemicals Division
P O Box 1087R
Morristown N J 07960

3 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 384
Jersey City N J 07303

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** CP NF USP Reagent Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 96 1
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 5 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

NOTES

AMC — AMMONIUM CHLORIDE

Common Synonyms
Ammonium muriate
Sal ammoniac
Salmiac
Amchloride
Ammonyx

Solid | White | Odorless

Sinks and mixes slowly with water

[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated
Wear goggles and self-[illegible] breathing [illegible]

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea
[illegible]
IN EYES [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Amchlor, Ammonex, Ammonium muriate, Sal ammoniac, Salmiac
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** NH_4Cl
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gloves of any material, safety glasses or chemical safety goggles, dust mask or respirator as necessary
5 2 **Symptoms Following Exposure:** Inhalation of fumes irritates respiratory passages. Ingestion irritates mouth and stomach. Fumes are irritating to eyes. Contact with skin may cause irritation
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. INGESTION: give large amount of water, get medical attention if irritation persists. EYES OR SKIN: flush with plenty of water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 1650 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic and irritating ammonia and hydrogen chloride gases may form in fire
6 6 **Behavior in Fire:** May volatilize and condense on cool surfaces
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 6 ppm 96 hr sunfish TL_m, fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pennwalt Corp
Three Parkway
Philadelphia, Pa 19102

2 Allied Chemical Corp
Industrial Chemicals Division
P O Box 1139 R
Morristown, N J 07960

3 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 384
Jersey City, N J 07304

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** USP Reagent, Technical 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 53.5
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.53 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** 130 Btu/lb = 72 cal/g = 3.0×10^5 J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

ACI

AMMONIUM CITRATE

Common Synonyms
Diammonium citrate
Ammonium citrate
Citric acid Diammonium salt

Solid | White | Weak Ammonia Odor

Sinks and mixes with water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-[illegible]-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium citrate dibasic
Citric acid diammonium salt
Diammonium citrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(NH_4)_2HC_6H_5O_7$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Slight ammoniacal

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved dust respirator, eye goggles

5 2 **Symptoms Following Exposure:** Inhalation causes respiratory irritation. Ingestion causes diarrhea. Contact with eyes causes mild irritation.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water or physiological saline, get medical care if irritation persists. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic ammonia gas may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Pfizer Chemicals Div
235 E 42nd St
New York, N Y 10017

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown, N J 07960

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 226

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.48 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages [illegible] and [illegible]

NOTES

AMD — AMMONIUM DICHROMATE

Common Synonyms
Ammonium bichromate

Solid crystals or powder Orange to red Odorless

Sinks and mixes with water

Fire

FLAMMABLE
May cause fire on contact with combustibles
Containers may explode in fire

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Manual, CG-446-4

Isolate and deny entry to unprotected personnel
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ammonium bichromate
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $(NH_4)_2Cr_2O_7$
3.4 **IMCO/United Nations Numerical Designation:** None

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Orange to red; hygroscopic orange-red
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Use respiratory protective devices as necessary.
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membranes. Chronic inhalation may cause perforation of the nasal septum. Ingestion causes irritation of the mouth, throat and stomach. External contact can cause irritation and ulceration of the skin and eyes. Repeated contact may cause skin sensitization.
5.3 **Treatment for Exposure:** INHALATION remove victim to fresh air and administer oxygen if breathing is difficult. EYES immediately flush with water for at least 15 minutes, occasionally lifting upper and lower lids. SKIN flush with water. Remove contaminated clothing and shoes. INGESTION induce vomiting if victim is conscious. Do not induce vomiting if victim is unconscious or convulsing. Give large quantities of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³
5.5 **Short-Term Inhalation Limits.** Not pertinent
5.6 **Toxicity by Ingestion.** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Oxygen which will support combustion
6.6 **Behavior in Fire:** Decomposes above 180°C (356°F) with glowing red color and evolution of oxygen. Explosive decomposition may occur if heated above 225°C (437°F) in confined space.
6.7 **Ignition Temperature:** 450°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Can react with combustible materials such as wood and shavings
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Copper Shiner: 96 hour TL_m fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Allied Chemical Corporation
Specialty Chemicals Division
P.O. Box 1087R
Morristown, N.J. 07960

J.T. Baker Chemical Co.
222 Red School Lane
Phillipsburg, N.J. 08865

Mallinckrodt Chemical Works
225 West Side Avenue
P.O. Box 444
Jersey City, N.J. 07304

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Analytical reagent grade 99.0%, chemical grade 98.0%, technical grade 97.0%, C.P. grade 99.8%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

SSZ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizer
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard	Blue
Flammability	Red
Reactivity	Yellow

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 252.07
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.15 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** 47 Btu/lb (26.1 cal/g) when 10 Liters
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

AFR

AMMONIUM FLUORIDE

Common Synonyms
Neutral ammonium fluoride

Solid White Odorless

Sinks and mixes with water

[illegible] IN CASE OF FIRE, KEEP PEOPLE AWAY

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
POISONOUS IF SWALLOWED
Will burn skin and eyes
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-6

Issue warning - water contaminant
Dispose of safely

2. LABELS

Hazard label required
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Neutral ammonium fluoride
3.2 **Coast Guard Compatibility Classification.** Not listed
3.3 **Chemical Formula** NH_4F
3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color** White
4.3 **Odor** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask if exposed to dust, safety goggles
5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of the upper respiratory tract. Ingestion is harmful; readily soluble; relatively rapid absorption from the gastrointestinal tract. Contact with eyes causes irritation; chronic exposure may cause corneal damage. High concentrations may cause pulmonary edema. Skin contact may cause irritation.
5.3 **Treatment for Exposure:** Remove victim from exposure. If not breathing, INHALATION: give artificial respiration. If breathing is difficult, give oxygen. INGESTION: induce vomiting. Call physician immediately. EYES: Flush with plenty of water for at least 15 minutes. Call physician. SKIN: Wash with soap and water. Remove contaminated clothing. Wash clothing before reuse. Call physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 2.5 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion.** Data not available
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Data not available
5.9 **Liquid or Solid Irritant Characteristics** Data not available
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products:** Decomposes and may give off toxic fluoride gases at elevated temperatures
6.6 **Behavior in Fire:** May crackle and sputter and evolve ammonia and hydrogen fluoride
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves and hydrolyzes to release ammonia and fluoride ions
7.2 **Reactivity with Common Materials:** May corrode glass, ceramics and some metals
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Allied Chemical Corp
General Chemical Div
40 Rector St
New York, N.Y. 10006

2 J.T. Baker Chemical Co
Phillipsburg, N.J. 08865

3 Ozark-Mahoning Chemical Mfg Co
Mineral Wells, Texas
Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical, USP, Reagent, Electronic, Fused and MON
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-B
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 37.04
13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.32 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 72 Btu/lb = 40 cal/gm = 1.416 kJ/g
13.16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

AFM	# AMMONIUM FORMATE

Common Synonyms			
Formic acid ammonium salt	Solid	White	Weak ammonia odor
	Sinks and mixes slowly with water		

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. If swallowed will cause nausea
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Dispose and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Formic acid ammonium salt

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $HCOONH_4$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Weak ammonia

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion irritates mouth and stomach. Contact with eyes or skin causes irritation.

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. INGESTION: give large amounts of water, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 2,250 mg/kg (mouse)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic and irritating ammonia and formic acid gases may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 R N A Corporation
660 New Milford Rd
Oradell, N J 07649

2 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 344
Jersey City, N J 07304

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Analytical grade
Organic chemical grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

C

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 63.06

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:**
$270°F = 116°C = 389°K$

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.28 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 84 Btu/lb
= 47.1 cal/g = 1.97 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

AGC

AMMONIUM GLUCONATE

Common Synonyms	Solid White Weak ammoniacal odor Sinks and mixes with water
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE.
Exposure	DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $NH_4C_6H_{11}O_7$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** Weak ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirator for nuisance dust
5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Contact with eyes causes mild irritation
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15° C and 1 atm:** Solid
13 2 **Molecular Weight:** 213
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** > 1 at 20° C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 2 and 3)

NOTES

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pfizer Incorporated
Chemicals Div
235 E 42nd St
New York, N Y 10017

2 Pfahz and Bauer Inc
126-04 Northern Blvd
Flushing, N Y 11368

3 Schwartz Mann
Orangeburg, N Y 10962

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

AMH — AMMONIUM HYDROXIDE

(< 28% AQUEOUS AMMONIA)

Common Synonyms
Ammonia water
Aqueous ammonia

Water-white liquid [illegible] Ammonia odor

Floats and mixes with water. Irritating vapor is produced.

Fire

Not flammable

Exposure

VAPOR
Irritating to skin, eyes, nose and throat.
If inhaled, will cause severe vomiting, difficult breathing or loss of consciousness.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula: NH_4OH
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INHALATION [illegible] INGESTION [illegible] EYES OR SKIN
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion: Grade 3, oral rat, LD_{50} = 350 mg/kg
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire
6.7 Ignition Temperature
6.8 Electrical Hazard.
6.9 Burning Rate

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water
7.2 Reactivity with Common Materials
7.3 Stability During Transport
7.4 Neutralizing Agents for Acids and Caustics
7.5 Polymerization:
7.6 Inhibitor of Polymerization

8 WATER POLLUTION

8.1 Aquatic Toxicity
8.2 Waterfowl Toxicity
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

American Cyanamid Co.
[illegible]
Chemical Products
[illegible]
Mallinckrodt, Inc.
[illegible]

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

AMAS

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations
Corrosive Material
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

REVISED 1978

AID

AMMONIUM IODIDE

[illegible]	Solid	White	Odorless
	Sinks and mixes with water		

Fire

Not Flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning - water contaminated
Dispose as litter

2. LABELS

No hazard identification label
under Federal regulations

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: None
3.2 Coast Guard Compatibility Classification: Not listed
3.3 Chemical Formula: NH4I
3.4 IMCO/United Nations Numerical Designation: None

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: White
4.3 Odor: None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles if threshold limit is exceeded
5.2 **Symptoms Following Exposure:** Inhalation: coughing and irritation of nose and throat with eyes watering
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: if large amount has been ingested get medical attention. EYES: wash with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not known

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating fumes (hydrogen iodide, iodine and oxides of nitrogen) may be produced
6.6 **Behavior in Fire:** Compound may sublime in fire and undergo decomposition
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

American Hoechst Corp.
Chemicals and Plastics Division
Somerville, N.J. 08876

2. Mallinckrodt Chemical Works
222 Waverly Avenue
P.O. Box 344
Jersey City, N.J. 07304

3. J.T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** NF Reagent ACS
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

None

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** None
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** None

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 144.94
13.3 **Boiling Point at 1 atm:** Not pertinent
Not known
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.494 (20°C)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 4.1 kcal/g
Not known
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5

NOTES

ALT

AMMONIUM LACTATE

Common Synonyms			
DL-Lactic acid, ammonium salt Ammonium lactate syrup	Solid or liquid Sinks and mixes with water	White	Odorless

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.

LIQUID OR SOLID
Irritating to skin and eyes.
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Ammonium lactate syrup
dl Lactic acid, ammonium salt

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:**
$CH_3CH(OH)COONH_4$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat; contact with eyes causes irritation

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
(Combustible solids)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water
spray

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in a fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Tanatex Chemical Corp
P O Box 188
Lyndhurst N J 07071

2 Pfaltz and Bauer Inc
126-04 Northern Boulevard
Flushing N Y 11368

3 Gaillard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Pure
60% syrup in water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 107.11

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.2 at 15°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 1 and 4)

NOTES

ALS	# AMMONIUM LAURYL SULFATE

Common Synonyms		
Dodecyl sulfate, ammonium salt Lauryl ammonium sulfate	Liquid	Light yellow
	May float or sink and mix with water	

[illegible]

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes. Harmful if swallowed [illegible] [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Dodecyl sulfate, ammonium salt, Lauryl ammonium sulfate

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula:**
$C_{12}H_{25}OSO\text{-}ONH_4 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Light yellow

4 3 **Odor** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, goggles or face shield

5 2 **Symptoms Following Exposure** Contact with liquid irritates eyes and may have drying effect on the skin Prolonged contact will cause skin irritation

5 3 **Treatment for Exposure** EYES OR SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short Term Inhalation Limits.** Data not available

5 6 **Toxic by Ingestion** Data not available

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not pertinent (non combustible water solution)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen and sulfur may form in fires

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Richardson Company
Organic Chemicals Div
100 New Street
Paterson, N J 07501

2 Stepan Chemical Co
Edens and Winnetka
Northfield, Ill 60093

10. SHIPPING INFORMATION

10 1 **Grades or Purity** 28 30% solution in water

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 283 (solute only)

13 3 **Boiling Point at 1 atm** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 03 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

AMB

AMMONIUM MOLYBDATE

Common Synonyms
Molybdic acid (85%)

Solid Colorless to greenish-yellow or white Odorless

Sinks and mixes with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** Molybdic acid 85%
3.2 **Coast Guard Compatibility Classification** Not listed
3.3 **Chemical Formula** $(NH_4)_6Mo_7O_{24}·4H_2O$ (for CP and Reagent grades only)
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color:** White or greenish-yellow to colorless to yellow
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Dust mask, goggles, face shield, rubber gloves
5.2 **Symptoms Following Exposure.** Inhalation causes irritation of nose and throat. Contact with eyes causes irritation
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water for at least 15 min
5.4 **Toxicity by Inhalation (Threshold Limit Value,** 5 mg/m³ (as molybdenum)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion** Grade 3, oral rat LD_{50} = 333 mg/kg
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen may form in fire
6.6 **Behavior in Fire**
6.7 **Ignition Temperature** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction
7.2 **Reactivity with Common Materials**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co
Phillipsburg, N. J. 08865
2. Climax Molybdenum Company
One Greenwich Plaza
Greenwich, Conn. 06830
3. Varlacoid Chemical Co
666 South Front St
Elizabeth, N. J. 07202

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Reagent, CP
A closely related substance is also available: molybdic acid 85%
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight** 1235
13.3 **Boiling Point at 1 atm** Not pertinent
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity.** 2.4 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity.** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Data not available
13.16 **Heat of Polymerization** Not pertinent

Continued on page 4 and 5

NOTES

AMN — AMMONIUM NITRATE

Common Synonyms	Solid pellets or flakes	White to light gray or brown	Odorless
Nitrate	Sinks and mixes with water		

Call Fire Department. Keep people away.
[illegible]

Fire

May cause fire and explode on contact with combustibles
CONTAINERS MAY EXPLODE IN FIRE
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
[illegible]

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose, and throat
If inhaled, may cause coughing or difficult breathing
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

[illegible]

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]
3.2 Coast Guard Commodity Classification: Ammonia
3.3 Chemical Formula: NH_4NO_3
3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]
4.2 Color: [illegible]
4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Wear self-contained breathing apparatus
5.2 Symptoms Following Exposure: Irritation of eyes and mucous membranes
Absorption via ingestion or inhalation causes urination and acid urine. Large amount causes systemic acidosis and methemoglobinemia (abnormal hemoglobin)
5.3 Treatment for Exposure: Remove from exposure — symptoms reversible
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: [illegible]
5.6 Toxicity by Ingestion: [illegible]
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: Use flooding amounts of water in early stages of fire. When large quantities are involved in massive fires, control efforts should be confined to protection of exposures
6.4 Fire Extinguishing Agents Not to Be Used: [illegible]
6.5 Special Hazards of Combustion Products: [illegible]
6.6 Behavior in Fire: Mass explodes in fire. Supports combustion of many materials
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: [illegible]
6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]
7.2 Reactivity with Common Materials: [illegible]
7.3 Stability During Transport: Heated strongly decomposes, giving off toxic gases and gases which support combustion. Undergoes detonation if heated under confinement
7.4 Neutralizing Agents for Acids and Caustics: [illegible]
7.5 Polymerization: [illegible]
7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Allied Chemical Corp
[illegible]

Explosives & Chemical Propulsion Dept
Bessemer, Ala 35020

[illegible]

10 SHIPPING INFORMATION

10.1 Grades or Purity: Prilled fertilizer grade (33.5% nitrogen)
10.2 Storage Temperature: Data not available
10.3 Inert Atmosphere: Data not available
10.4 Venting: Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446

SS

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Oxidizing material
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications

Category	Classification*
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

*Extracted from 49 CFR 173.151

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: [illegible]
13.2 Molecular Weight: [illegible]
13.3 Boiling Point at 1 atm: [illegible]
13.4 Freezing Point: [illegible]
13.5 Critical Temperature: [illegible]
13.6 Critical Pressure: [illegible]
13.7 Specific Gravity: [illegible]
13.8 Liquid Surface Tension: [illegible]
13.9 Liquid-Water Interfacial Tension: [illegible]
13.10 Vapor (Gas) Specific Gravity: [illegible]
13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: [illegible]
13.15 Heat of Solution: [illegible]
13.16 Heat of Polymerization: [illegible]

Continued on next page

NOTES

REVISED 1978

ANP — AMMONIUM NITRATE-PHOSPHATE MIXTURE

Common Synonyms	Solid	Grayish white	Odorless
	Sinks and mixes with water		

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated
Containers may explode in fire

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes.
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning oxidizing material
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** NH_4NO_3 $(NH_4)_2HPO_4$ $NH_4H_2PO_4$ $CaHPO_4$ KCl K_2SO_4
3 4 **IMCO/United Nations Numerical Designation:** 9/

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Grayish white
4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus must be used when fighting fires At other times a dust mask is adequate
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat Contact with eyes causes irritation
5 3 **Treatment for Exposure.** INHALATION move to fresh air EYES flush with water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used** Steam inert gases foam dry chemical
6 5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of nitrogen may form in fires
6 6 **Behavior in Fire:** Will increase intensity of fire when in contact with combustible material Containers may explode
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Corrodes metals to same degree as ordinary fertilizer the reaction is not hazardous
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Chevron Chemical Co
940 Hensley Street
Richmond Calif 94804

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Several grades of varying composition all of which contain less than 70% of ammonium nitrate the only hazardous ingredient
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Ventilated (natural)
10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 ***Code of Federal Regulations:*** Oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** Not pertinent (mixture)
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 1 8 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Data not available
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization.** Not pertinent

(Continued on page 5 and 6)

NOTES

ANS	AMMONIUM NITRATE-SULFATE MIXTURE

Common Synonyms	Solid	Grayish white	Odorless
	Sinks and mixes with water		

[redacted]

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Irritating gases may be produced when heated
Containers may explode in fire
[redacted]

Exposure

[redacted]
DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[redacted]

SOLID
Irritating to skin and eyes
Harmful if swallowed
[redacted]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[redacted]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning oxidizing material
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $NH_4NO_3 \cdot (NH_4)_2SO_4$
3 4 **IMCO/United Nations Numerical Designation:** 9/

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Grayish white
4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus must be used when fighting fires At other times a dust mask is adequate
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat Contact with eyes causes irritation
5 3 **Treatment for Exposure:** INHALATION move to fresh air EYES flush with water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3, oral rat LD_{50} = 58 mg/kg (ammonium sulfate)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used:** Steam inert gases foam dry chemical
6 5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of nitrogen may form in fires
6 6 **Behavior in Fire:** Will increase intensity of fire when in contact with combustible material Containers may explode
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Corrodes metals to same degree as ordinary fertilizer the reaction is not hazardous
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Chevron Chemical Co
940 Hensley Street
Richmond Calif 94804

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Several grades of varying composition all of which contain less than 70% of ammonium nitrate the only hazardous ingredient
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Ventilated (natural)
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM C
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm.** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 8 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Data not available
13 15 **Heat of Solution.** Data not available
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 4 and 5

NOTES

ANU — AMMONIUM NITRATE-UREA SOLUTION

Common Synonyms

Liquid | Colorless | Slight ammonia odor

Sinks and mixes with water

Fire

Not flammable

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Dispersal Water

2. LABELS

Not specifically listed in Hazardous Materials Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Nitrogen solutions
Nitrogen solutions (non-pressure)

3.2 **Coast Guard Compatibility Classification**
Mix with like substances

3.3 **Chemical Formula:**
$NH_4NO_3 \cdot NH_2CONH_2 \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Colorless

4.3 **Odor** Weak ammonia

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure** Liquid or solution is primary irritant to skin, eyes and mucous membranes. Solutions containing more than 2% free ammonia are more irritating

5.3 **Treatment for Exposure** EYES: wash with plenty of water for at least 15 minutes and seek medical attention. SKIN: remove contaminated clothing and wash skin with soap and water. INGESTION: induce vomiting immediately by giving two glasses of water and sticking finger down throat. Call physician immediately. Do not induce vomiting or give anything by mouth to unconscious person. INHALATION: remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Grade 2 LD50 (rat) 3.0 g/kg

5.7 **Late Toxicity** None

5.8 **Vapor (Gas) Irritant Characteristics** Vapor or mist is irritating to eyes, mucous membranes and upper respiratory tract.

5.9 **Liquid or Solid Irritant Characteristics** Mild irritant to skin, eyes and mucous membranes. Prolonged contact may cause burns.

5.10 **Odor Threshold** Not specific

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air** Not applicable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products**
Not pertinent

6.6 **Behavior in Fire** Water may boil violently, evaporate and decomposition products may be expelled.

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Mid-South Agricultural Chemicals
Inc.
P.O. Box
Memphis, Tennessee

W.R. Grace & Co.
Agricultural Chemicals Group
P.O. Box
Memphis, Tennessee

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data are for non-pressure solutions containing 41.3% ammonium nitrate, 45.4% urea and 13% water. Other grades contain 0.70% free ammonia and 0.3% urea or are free ammonia and water. Those containing more than 2% free ammonia are stored under pressure or cooled to -108°F for hazards of these see Ammonium Hydroxide

10.2 **Storage Temperature.** Ambient

Continued on page 4

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NP

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	
Poisons	
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

Physical State at 15°C and 1 atm: Liquid

13.2 **Molecular Weight** Not pertinent

13.3 **Boiling Point at 1 atm**
>212°F = >100°C = >373°K

13.4 **Freezing Point.**
32°F = 0°C = 273°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity.** 25°/4°C Liquid

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization**
Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:**
0 Btu/lb = cal/g = 0 J/kg

13.16 **Heat of Polymerization** Not pertinent

Continued on page 4

10 SHIPPING INFORMATION (Cont'd)

10.3 **Inert Atmosphere** No requirement

10.4 **Venting.** Open if >2% free ammonia, else pressure vacuum

AOL

AMMONIUM OLEATE

Common Synonyms
Oleic acid, ammonium salt
Ammonia soap

Solid paste | Yellow brown | Weak ammonia odor

Sinks and mixes with water

Stop discharge if possible. Keep people away.
Avoid contact with solid.
Isolate and deny unauthorized access.
Notify local health and wildlife officials.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, CO2, water.

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: Hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim CONSCIOUS, have victim drink water.
IF SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS:
do not give anything by mouth.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of potable water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flash

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Ammonia soap
Oleic acid, ammonium salt

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula:**
$C_{17}H_{33}COONH_4 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation** Not Listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Paste solid

4 2 **Color:** Yellow brown

4 3 **Odor:** Weak ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Contact with eyes causes irritation. Prolonged contact may cause skin irritation

5 3 **Treatment for Exposure:** EYES OR SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air.** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Emkay Chemical Co
319 Second Street
Elizabeth, N J 07206

2 Pfaltz and Bauer, Inc
126-04 Northern Blvd
Flushing, N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 70% in water
Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** Ventilated (natural)

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Data not available

12 3 **NFPA Hazard Classifications:**
Data not available

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Solid or liquid

13 2 **Molecular Weight:** 299 (solute)

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** >1 at 20°C (liquid or solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion.** Data not available

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(Continued on page 5 and 6)

NOTES

AOX

AMMONIUM OXALATE

Common Synonyms
Oxalic acid, diammonium salt
Diammonium oxalate
Ammonium oxalate hydrate

Solid | White | Odorless

Sinks and mixes slowly with water

AVOID CONTACT WITH SOLID AND DUST KEEP PROTECTIVE WEAR
Wear face respirator and [illegible] including gloves
[illegible]
Call Fire Department
[illegible]
Notify Local Health and Pollution Control Agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained [illegible]
Extinguish with water [illegible]

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing.
[illegible]
SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes.
[illegible]
Flush off contaminated skin with water
IF INHALED [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED and has not VOMITED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium oxalate hydrate
Diammonium oxalate Oxalic acid diammonium salt

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(NH_4)_2C_2O_4 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved dust respirator rubber or plastic coated gloves chemical goggles

5 2 **Symptoms Following Exposure:** Ingestion or excessive inhalation of dust causes systemic poisoning, possible symptoms include pain in throat esophagus and stomach mucous membranes turn white, vomiting severe purging weak pulse, cardiovascular collapse neuromuscular symptoms Contact with eyes causes irritation Contact with skin causes irritation or severe burns

5 3 **Treatment for Exposure:** *Speed is essential* INHALATION remove to fresh air INGESTION call physician immediately induce vomiting EYES flush with water and seek medical attention SKIN flush with water OTHER watch for swelling of the glottis and delayed constriction of the esophagus

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Kidney damage

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Pfizer Chemical Div
235 E 42nd Street
New York N Y 10017

2 Hexo Inc
Delaware Water Gap Pa 18327

3 American Hoechst Corp
Chemicals and Plastics Div
Rt 202-206 North
Somerville N J 08876

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure 98 100%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 142 11

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes at 70°C)

13 4 **Freezing Point:** Not pertinent (decomposes at 70°C)

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 50 at 18 5°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** 101 Btu/lb = 56 cal/g = 2 3×10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6

NOTES

APB AMMONIUM PENTABORATE

Common Synonyms
Ammonium pentaborate tetrahydrate
Ammonium decaborate octahydrate

Solid | White | Odorless

Sinks and mixes slowly with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Ammonium decaborate octahydrate
Ammonium pentaborate tetrahydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $NH_4B_5O_8 \cdot 4H_2O$ or $(NH_4)_2B_{10}O_{16} \cdot 8H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Disposable type respirator, side shield safety spectacles, full brimmed hard hat, goggles, ammonia gas mask

5 2 **Symptoms Following Exposure:** Inhalation of dust may result in non specific irritation of upper respiratory tract. Ingestion of large quantities may produce symptoms of non specific irritation of the gastrointestinal tract: nausea, vomiting, cramps, diarrhea. Contact with dust causes moderate eye irritation and minor skin irritation.

5 3 **Treatment for Exposure:** INHALATION: move from contaminated atmosphere, if respiratory discomfort persists see a physician. INGESTION: give large amounts of water or warm salty water to induce vomiting and continue until vomitus is clear, obtain medical attention if abdominal discomfort persists. EYES: flush with large quantities of running water for a minimum of 15 min, obtain medical help if irritation persists. SKIN: immediately flush affected areas with water, obtain medical help if irritation persists.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³ (as boric oxide)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Non flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 U S Borax and Chemical Corp
3075 Wilshire Blvd
Los Angeles, Calif 90010

2 American Hoechst Corp
Chemicals and Plastics Div
Rt 206-206 North
Somerville, N J 08876

3 Stauffer Chemical Co
Industrial Chemical Div
Westport, Conn 06880

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure 99%
Radio 99.9% Technical 99.8%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not pertinent

12 3 **NFPA Hazard Classifications:** Not pertinent

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 237.20

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.58 at 15°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

© USAMRIID, Fort Detrick, Frederick, MD 21701

AMP	# AMMONIUM PERCHLORATE

Common Synonyms

Solid crystals White Odorless

Sinks and mixes with water

Wear goggles and self-contained breathing apparatus
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

May cause fire and explode on contact with combustibles
CONTAINERS MAY EXPLODE IN FIRE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus
Evacuate surrounding area
Combat large fires from protected location with unmanned hose holder or monitor nozzle

Exposure

FIRST AID

SOLID
Irritating to eyes and skin
Harmful if swallowed
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (two glasses)

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Isolate hazard area and deny entry
Issue warning - oxidizing material
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** NH_4ClO_4
3.4 **IMCO United Nations Numerical Designation.** 9.1442

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available
5.2 **Symptoms Following Exposure:** Irritating to skin and mucous membranes
5.3 **Treatment for Exposure:** Data not available
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion.** Grade 2, oral rat LD_{50} = 3500 mg/kg
5.7 **Late Toxicity:** Not pertinent
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Water from protected location
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products.** Toxic gases are produced in fire
6.6 **Behavior in Fire:** May explode when involved in fire or exposed to shock or heat
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** If contaminated with combustible material or water it can become an explosive which is sensitive to shock and friction. Readily detonates or explodes
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Kerr-McGee Chemical Corp
   Kerr-McGee Bldg
   Oklahoma City, Okla 73102
2. Pacific Engineering & Production Co of Nevada
   Henderson, Nev 89015
3. G. Frederick Smith Chemical Co
   P O Box 23344
   Columbus, Ohio 43223

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available
10.2 **Storage Temperature:** Data not available
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	0 2
Flammability (Red)	0 1
Reactivity (Yellow)	3 3
Special	OXY OXY

*First column refers to fire exposure

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 117.49
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.95 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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APE

AMMONIUM PERSULFATE

Common Synonyms
Ammonium peroxydisulfate
Peroxydisulfuric acid, diammonium salt

Solid | Light straw to colorless | Mild unpleasant odor

Sinks and mixes with water

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
Harmful if inhaled

SOLID
Irritating to skin and eyes
Harmful if swallowed.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning. Avoid dusting material.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium peroxydisulfate; Peroxydisulfuric acid, diammonium salt
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $(NH_4)_2S_2O_8$
3.4 **IMCO/United Nations Numerical Designation:** 9-1326

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Light straw to colorless
4.3 **Odor:** Slight acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** U.S. Bu. M. approved toxic dust mask, chemical goggles, rubber gloves, neoprene coated shoes
5.2 **Symptoms Following Exposure:** Inhalation produces slight toxic effects. Contact with dust irritates eyes and causes skin rash.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: wash with water for 20 min. call a physician. SKIN: wash with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; rat oral LD_{50} = 2 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water
6.4 **Fire Extinguishing Agents Not to be Used.**
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and sulfur may be produced in fire.
6.6 **Behavior in Fire:** Decomposes on heating to give off gas that increases pressure in fire.
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Contact with grease, wood and other combustibles may result in a fire.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 320 ppm, 48 hr daphnia TL_m, fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. FMC Corporation
8510 River Rd. and Sawyer Ave.
Tonawanda, N.Y. 14150
2. Allied Chemical Corp.
Specialty Chemicals Div.
P.O. Box 1087R
Morristown, N.J. 07960
3. J.T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Reagent, pure
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

SN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing solid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 228.20
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes at 120°C)
13.4 **Freezing Point:** Not pertinent (decomposes at 120°C)
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.98 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Data not available
13.15 **Heat of Solution:** -77 Btu/lb = -43 cal/g = -1.8 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

APP

AMMONIUM PHOSPHATE

Common Synonyms
Monoammonium orthophosphate
Ammonium phosphate, dibasic
Secondary ammonium phosphate
Diammonium hydrogen phosphate
Diammonium orthophosphate

Solid | White | Weak ammonia odor

Sinks and mixes with water

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Personnel Protection Handbook CG-446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium phosphate, dibasic
Diammonium hydrogen phosphate
Diammonium orthophosphate
Monoammonium orthophosphate
Secondary ammonium phosphate

3.2 **Coast Guard Compatibility Classification:** Not Listed

3.3 **Chemical Formula:** $NH_4H_2PO_4$ and $(NH_4)_2HPO_4$

(Continued on page 4)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** Diammonium: faint ammonia
Monoammonium: faint acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, protective gloves and goggles. When diammonium phosphate is stored in closed area, self contained breathing apparatus is required to protect against ammonia fumes

5.2 **Symptoms Following Exposure:** Inhalation of monoammonium form causes irritation of mucous membranes. Inhaled diammonium form ammonia vapors can cause pulmonary edema and asphyxia. Contact with solid or with ammonia gas causes irritation of eyes and skin

5.3 **Treatment for Exposure:** INHALATION of exposed to ammonia fumes from diammonium phosphate: give artificial respiration and oxygen if needed; endotracheal. EYES: flush with water for at least 15 min. If irritation persists, get medical attention. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Lete Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating fumes of ammonia and oxides of nitrogen may form in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
155 ppm 96 hr bathhead minnow TL_m

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (dOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. J T Baker Chemical Co
Phillipsburg, N J 08865
2. Mobil Oil Corporation
150 E 42nd Street
New York, N Y 10017
3. Occidental Chemical Co
P O Box 198
Lathrop, Calif 95330

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Not required

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:**
Monoammonium: 115
Diammonium: 132

13.3 **Boiling Point at 1 atm:** Not pertinent
(begins to decompose at 100°C)

13.4 **Freezing Point:** Not pertinent
(begins to decompose at 100°C)

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:**
Diammonium: 1.8 at 20°C (solid)
Monoammonium: 1.6 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 42 Btu/lb = 23 cal/g = 0.9 x 10^5 J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 4)

3 CHEMICAL DESIGNATIONS (Cont'd)

3.4 **IMCO/United Nations Numerical Designation:** Not listed

ASL

AMMONIUM SILICOFLUORIDE

Common Synonyms
Ammonium fluosilicate

Solid | White | Odorless

Sinks and mixes slowly with water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Inhaled will cause coughing or difficult breathing

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Toxic material; water contaminant
Personal access
Dispersal/Dust

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium fluosilicate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $(NH_4)_2SiF_6$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, acid resistant clothing and hat, rubber gloves, goggles and safety shoes

5.2 **Symptoms Following Exposure:** Inhalation of dust can cause pneumonitis, irritation and can be fatal in some cases. Ingestion may be fatal. Contact with dust causes irritation of eyes and irritation or ulceration of skin.

5.3 **Treatment for Exposure:** INHALATION: remove patient to fresh air. INGESTION: cause vomiting by giving soapy water or mustard water. Have patient drink large quantities of lime water. If necessary, give stimulant such as strong coffee. Keep patient warm. EYES: flush with water for 20 min. holding eyelids open. SKIN: wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2.5 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 Poison. 0.1 gram/kg rat LD50

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen fluoride, silicon tetrafluoride and oxides of nitrogen may form in fires.
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Agrico Chemical Co
P. O. Box [illegible]
Pierce/Polk County, Fla. [illegible]

2 Essex Chemical Co
Chemicals Division
[illegible] Broad Street
Clifton, N. J. 07015

3 W. R. Grace & Co
Agricultural Chemicals Group
Baltimore, Md. 21203

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Pure, 98+%
Commercial, 90+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 178.13
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.0 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** [illegible] Btu/lb mol cal/g = 2.0 kcal/g mol
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

AMR	# AMMONIUM STEARATE

Common Synonyms			
Ammonium stearate dispersion Stearic acid, ammonium salt	Solid paste or liquid May float or sink in water	White to yellow	Weak ammonia odor

Stop discharge if possible. Keep people away
Call fire department
Avoid contact with liquid and solid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Combustible solid Solution not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and self-contained breathing apparatus Extinguish with water, dry chemicals, foam, or carbon dioxide
Exposure	CALL FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes If swallowed will cause nausea Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-448-4

Dike, contain

2. LABELS

Not Federally Required

3 CHEMICAL DESIGNATIONS

3.1* Synonyms: Ammonium stearate dispersion; Stearic acid, ammonium salt

3.2 Coast Guard Compatibility Classification: Not listed

3.3 Chemical Formula: $C_{17}H_{35}COONH_4 \cdot H_2O$

3.4 IMCO/United Nations Numerical Designation: Not listed

4 OBSERVABLE CHARACTERISTICS

4.1* Physical State (as shipped): Paste, solid or liquid

4.2 Color: White to yellow

4.3 Odor: Slight ammonia odor

5. HEALTH HAZARDS

5.1* Personal Protective Equipment: Goggles and gloves

5.2 Symptoms Following Exposure: Not known; [illegible]

5.3 Treatment of Exposure: INHALATION: [illegible]; INGESTION: [illegible]; EYES: [illegible]; SKIN: [illegible]

5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available

5.5 Short-Term Inhalation Limits: Data not available

5.6 Toxicity by Ingestion: Data not available

5.7 Late Toxicity: Data not available

5.8 Vapor (Gas) Irritant Characteristics: Not known

5.9 Liquid or Solid Irritant Characteristics: Data not available

5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1* Flash Point: > 100 F C.O.C. (Open cup method)

6.2 Flammable Limits in Air: Not pertinent

6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide

6.4 Fire Extinguishing Agents Not to be Used: Not known

6.5 Special Hazards of Combustion Products: Toxic ammonia and nitrogen oxide fumes

6.6 Behavior in Fire: [illegible]

6.7 Ignition Temperature: Data not available

6.8 Electrical Hazard: Not pertinent

6.9 Burning Rate: Not pertinent

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: Not reactive

7.2 Reactivity with Common Materials: [illegible]

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

8. WATER POLLUTION

8.1* Aquatic Toxicity: Data not available

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): Data not available

8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Diamond Shamrock Chemicals Co.
1 Superior Avenue
Cleveland, Ohio 44114

[illegible]
[illegible]
Elizabeth, N.J. [illegible]

10 SHIPPING INFORMATION

10.1* Grades of Purity: 33% dispersion in water technical paste

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: No requirement

10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

APAN

12. HAZARD CLASSIFICATIONS

12.1* Code of Federal Regulations: Not listed

12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed

*12.3 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Solid or liquid

*13.2 Molecular Weight: 346

*13.3 Boiling Point at 1 atm: Not pertinent; decomposes

13.4 Freezing Point: Not pertinent

13.5 Critical Temperature: Not pertinent

13.6 Critical Pressure: Not pertinent

13.7 Specific Gravity: 0.9 at 20°C (liquid)

13.8 Liquid Surface Tension: Not pertinent

13.9 Liquid-Water Interfacial Tension: Not pertinent

13.10 Vapor (Gas) Specific Gravity: Not pertinent

13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent

13.12 Latent Heat of Vaporization: Not pertinent

13.13 Heat of Combustion: Data not available

13.14 Heat of Decomposition: Not pertinent

13.15 Heat of Solution: Not pertinent

13.16 Heat of Polymerization: Not pertinent

(Continued on page 3 and 4)

NOTES

ASM

AMMONIUM SULFAMATE

Common Synonyms
Amnate
Sulfamic acid, monoammonium salt
Ammonium amidosulfonate
Ammonium amidosulphate
AMS

Solid | White or brownish gray | Odorless

Sinks and mixes with water

Stop discharge if possible. Keep people away.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Amnate, Ammonium amidosulfonate, Ammonium amidosulphate, AMS, Sulfamic acid, monoammonium salt

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $NH_2SO_3NH_4$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White or brownish gray

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes gastrointestinal disturbances. Dust irritates eyes.

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. INGESTION: give large amount of water, get medical attention. EYES: flush with water for 15 min. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 1,600 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold.** Data not available

5 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 249 ppm/24 hr catfish 50% kill fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Hexcel Inc
Delaware Water Gap, Pa 18327

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Pfaltz and Bauer Inc
126 04 Northern Blvd
Flushing, N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent 99.0%, Commercial 86%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 114 13

13 3 **Boiling Point at 1 atm:** Decomposes above 200°C

13 4 **Freezing Point:** 268°F = 131°C = 404°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** > 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

AMS — AMMONIUM SULFATE

Common Synonyms	Solid	White	Odorless
	Sinks and mixes with water		

Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Not flammable
Exposure	Not harmful.
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. Notify local health and wildlife officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $(NH_4)_2SO_4$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Data not available
5 2 **Symptoms Following Exposure:** Data not available
5 3 **Treatment for Exposure:** Data not available
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 58 mg/kg (rat)
5 7 **Late Toxicity:** Not pertinent
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** Not pertinent
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
1290 ppm/96 hr/mosquitofish/freshwater/TL_m
292 ppm/96 hr/Daphnia magna/freshwater/TL_m
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Agricultural Div
Morristown N J 07960
2 Occidental Petroleum Corp
Occidental Chemical Co
Western Division
Lathrop Calif 95330
3 Valley Nitrogen Producers Inc
Fresno, Calif 93721

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Data not available
10 2 **Storage Temperature:** Data not available
10 3 **Inert Atmosphere:** Data not available
10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 132.14
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.78 at 15°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6

NOTES

REVISED 1978

ASF

AMMONIUM SULFIDE

Common Synonyms			
Ammonium sulfide solution Ammonium hydrogen sulfide solution Ammonium sulfhydrate solution	Liquid	Colorless to yellow	Strong odor of rotten eggs and ammonia
	Mixes with water. Irritating vapor is produced. Boiling point is 104°F		

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause dizziness, headache, coughing, or difficult breathing.

LIQUID
Will burn skin and eyes.
If swallowed will cause nausea

DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: air contaminant, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium hydrogen sulfide solution, Ammonium sulfhydrate solution, Ammonium sulfide solution

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(NH_4)_2S$, NH_4SH, H_2O

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Yellow to orange (fuming solutions); colorless to yellow

4 3 **Odor:** Strong odor of sulfide and ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber or plastic gloves, splash goggles, rubber shoes

5 2 **Symptoms Following Exposure:** Inhalation of 500 ppm for 30 min. produces headaches, dizziness, bronchial pneumonia; 600 ppm for 30 min. can cause death. Ingestion causes severe irritation of mucous membranes and stomach. Contact with liquid causes severe burns of eyes and severe skin irritation. May be absorbed through skin and cause hydrogen sulfide poisoning.

5 3 **Treatment for Exposure:** *Get medical attention following all overexposures to this compound.* INHALATION: move victim to fresh air, give artificial respiration, oxygen, consult physician. INGESTION: give large amount of water. EYES OR SKIN: wash with large quantities of water for 15 min., consult physician.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 72°F C C

6 2 **Flammable Limits in Air:** 4% - 46% (hydrogen sulfide)

6 3 **Fire Extinguishing Agents.** Water, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic hydrogen sulfide gas is released when solution is heated. If ignited, this will form irritating sulfur dioxide gas.

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Severely corrodes copper, zinc and their alloys

7 3 **Stability During Transport:** Stable, but toxic hydrogen sulfide and ammonia gases may collect in enclosed spaces

7 4 **Neutralizing Agents for Acids and Caustics:** Dilute with water. Do not attempt to neutralize with acid.

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 100 ppm/72 hr/goldfish/killed/fresh water; 248 ppm/48 hr/mosquitofish/TL_m/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Argus Chemical Corp.
Halby Division
600 Terminal Avenue
New Castle, Del. 19720

2 J. T. Baker Chemical Co.
Phillipsburg, N. J. 08865

3 Chemical Products Corporation
Cartersville, Ga. 30120

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, 45 - 50% in water; Reagent, 52 - 60% in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** Ventilated (natural)

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid or liquid

13 2 **Molecular Weight:** 68.14 (solute)

13 3 **Boiling Point at 1 atm:** 104°F = 40°C = 313°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.99 - 1.01 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 95.0 Btu/lb = 52.8 cal/g = 2.21×10^5 J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

AMF	# AMMONIUM SULFITE

Common Synonyms

Solid White Odorless

Sinks and mixes slowly with water

Stop discharge if possible. Keep people away.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is NOT CONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** $(NH_4)SO_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes.
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, get medical attention. EYES: flush with water for 15 min. SKIN: flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic sulfur dioxide and oxides of nitrogen may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Dilute with water. Do not attempt to neutralize with acids
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 240 ppm/48 hr/mosquitofish/TL$_m$/fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTUREPS

1 J T Baker Chemical Co
Phillipsburg, N J 08865

2 Pfaltz and Bauer, Inc.
126-04 Northern Blvd
Flushing, N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Anhydrous, Purified monohydrate
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Data not available
12 3 **NFPA Hazard Classifications.** Data not available

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 134.2
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** > 1.1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** 20.5 Btu/lb = 11.4 cal/g = 0.477 × 10^5 J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 1 AMF)

NOTES

ATR AMMONIUM TARTRATE

Common Synonyms
1 Tartaric acid, ammonium salt

Solid | White | Odorless

Sinks and mixes with water

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with solid and dust.
Solid and liquid discharged are dangerous.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with water.

Exposure

CALL FOR MEDICAL AID.
DUST
Irritating to eyes, nose and throat.
Harmful if inhaled.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
SOLID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give anything by mouth.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** *l*-Tartaric acid ammonium salt
3 2 **Coast Guard Compatibility Classification:** Not Listed
3 3 **Chemical Formula.** $C_4H_{12}N_2O_6$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Contact with solid may irritate eyes
5 3 **Treatment for Exposure:** EYES flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen or ammonia gas may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Ganes Chemical Works, Inc
611 Broad Street
Carlstadt, N J 07072

2 American Hoechst Corp
Chemicals and Plastics Division
Rt 202 206 North
Somerville, N J 08876

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Analytical Pure
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Data not available
12 3 **NFPA Hazard Classifications:** Data not available

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 184
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.6 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

AMT — AMMONIUM THIOCYANATE

Common Synonyms
Ammonium sulfocyanate
Ammonium rhodanate
Ammonium rhodanide
Ammonium sulfocyanide
Thiocyanic acid, ammonium salt

Solid or solution (in water) | White | Odorless

Sinks and mixes with water

[illegible] discharge if possible. Keep people away
[illegible] Department
Avoid [illegible] material [illegible]
Avoid [illegible] with [illegible]
Isolate [illegible] for [illegible] hours
Notify [illegible] if [illegible] discharge occurs

Fire

Combustible Solid. Solution not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear gloves and [illegible] clothing. Avoid [illegible] dust. Do not breathe dust
Extinguish with water

Exposure

CALL FOR MEDICAL AID
VAPOR OR DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.
Remove victim to fresh air and flush with plenty of water
Treatment is symptomatic and supportive
Do not induce vomiting
LIQUID OR SOLID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting
Avoid [illegible] dust. Avoid [illegible]
Flush area [illegible] with [illegible] water
IF IN EYES [illegible] with [illegible] water [illegible]
IF SWALLOWED [illegible] — CONSCIOUS [illegible] water [illegible] or milk
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible] Bring victim to [illegible]

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify [illegible] authorities [illegible]
Notify [illegible] water [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning — water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium rhodanate, Ammonium rhodanide, Ammonium sulfocyanate, Ammonium sulfocyanide, Thiocyanic acid, ammonium salt

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** NH_4SCN

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid, or solution in water

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber or plastic gloves, rubber or plastic apron, standard goggles

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes dizziness, cramps, nervous disturbances. Dust irritates eyes. Can be absorbed through skin, prolonged contact may produce various skin eruptions, dizziness, cramps, nausea, and mild to severe disturbance of the nervous system

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, get medical attention. EYES OR SKIN: wash with water, consult physician

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 854 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Solid mass be combustible, solution is not flammable

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agent:** Water

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Decomposes to form ammonia, hydrogen sulfide, and hydrogen cyanide. Oxides of nitrogen may also form. All of these products are toxic

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent.

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
280 - 300 ppm/1 hr orange-spotted sunfish/killed fresh water
420 ppm/48 hr mosquitofish/TL m/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
< 0.6 to 0.10 lb lb 5 days

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Argus Chemical Corp
Halby Division
600 Terminal Ave
New Castle, Del. 19720

2 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 394
Jersey City, N J 07303

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent, Technical
50 - 65% solution, in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 445-3)

A P S S

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid or liquid

13 2 **Molecular Weight:** 76.12

13 3 **Boiling Point at 1 atm:** (solid on solid decomposes) 230°F = 110°C = 383°K

13 4 **Freezing Point:** (solid) 320°F = 160°C = 433°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:**
> 1.1 at 20°C (solid)
1.1 - 1.15 at 20°C (solution)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:**
133 Btu/lb = 75 cal/g = 3.1 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 of 8)

NOTES

ATF

AMMONIUM THIOSULFATE

Common Synonyms			
Ammonium hyposulfite	Solid or solution (in water)	Colorless liquid or white solid	Ammonia odor
	Sinks and mixes with water		

Stop discharge if possible. Keep people away.
Avoid contact with liquid and solid.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
If inhaled will cause difficult breathing.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLUTION OR SOLID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IN EYES, hold eyelids open and flush with plenty of water.
SWALLOWED (conscious) INDUCE VOMITING (give victim 1 or 2 glasses of water or milk).
IF SWALLOWED (unconscious or having convulsions) DO NOTHING except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium hypo, Ammonium hyposulfite
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $(NH_4)_2S_2O_3$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid, or solution in water
4.2 **Color:** Clear, colorless
4.3 **Odor:** Ammonia

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator, rubber gloves, safety glasses, face shield, rubber apron, shield or suit as necessary to prevent skin contact
5.2 **Symptoms Following Exposure:** Inhalation of dust may irritate respiratory system. Ingestion could be harmful. Contact with eyes or skin may cause irritation.
5.2 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: get medical attention at once. EYES: flush with plenty of water for at least 15 min. and get immediate medical attention. SKIN: wash with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic ammonia, hydrogen sulfide and oxides of nitrogen and sulfur may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable but toxic ammonia gas may collect in enclosed spaces
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.62 lb/lb 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Div
P O Box 1139R
Morristown, N J 07960

2 Natco Corporation
12520 Cerise Avenue
Hawthorne, Calif 90250

3 Gallard-Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place, N Y 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, Analytical, Technical, 60% solution in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Ventilated (natural)
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid
13.2 **Molecular Weight:** 148.2
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

AML

AMYL ACETATE

Common Synonyms
Acetic acid
n-amyl ester

Watery liquid Colorless to yellow Banana odor

Floats on water. Flammable irritating vapor is produced.

Shut off ignition sources and call fire department.
Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, headache or dizziness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-6)

Issue warning: high flammability.
Mechanical containment.
Chemical and physical treatment.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Amyl acetate, mixed isomers; Pentyl acetates
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** $CH_3COOC_5H_{11}$
3.4 **IMCO United Nations Numerical Designation.** 3.2 1104

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to yellow
4.3 **Odor:** Pleasant banana-like; mild characteristic banana or pear-like odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air-supplied mask or chemical cartridge respirator; protective gloves; goggles; safety shower and eye bath.
5.2 **Symptoms Following Exposure:** Irritation of eyes, nose and throat. Dizziness, nausea, headache.
5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air; call physician; administer oxygen. SKIN OR EYES: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5.5 **Short-Term Inhalation Limits.** 200 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 1; LD_{50} = 6.5 g/kg (rat)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.08* ppm

6 FIRE HAZARDS

6.1 **Flash Point.** [illegible] 91°F C.C.
6.2 **Flammable Limits in Air:** 1.1 to 7.5% (v)
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water in straight hose stream; water and sodium acid carbonate should not be used
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 775°F (413°C)
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4.1 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
120 ppm 48 hr. daphnia; 11 ppm, tolerated water
180 ppm, 96 hr. scenedesmus; 11 ppm, fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.5, 0.8 lb/lb/5 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Commercial Solvents Corp.
245 Park Avenue
New York, N.Y. 10017
2. Pfaltzer Industries, Inc.
142nd & Walnut St.
Philadelphia, Pa. 19102
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 85, 99% technical, commercial
10.2 **Storage Temperature:** Ambient (max.)
10.3 **Inert Atmosphere:** Nitrogen or CO2
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

XTU

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 130.19
13.3 **Boiling Point at 1 atm.**
295°F = 146°C = 419°K
13.4 **Freezing Point:**
< -130°F = < -109°C = < 273°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.876 at 20°C (liquid)
13.8 **Liquid Surface Tension**
12 dynes/cm = 0.012 N/m at 30°C
13.9 **Liquid-Water Interfacial Tension.**
less than 10 dynes/cm = 0.01 N/m at 18°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):**
13.12 **Latent Heat of Vaporization:**
140 Btu/lb = 78 cal/g = 3.3 × 10^5 J/kg
13.13 **Heat of Combustion.** -13,960 Btu/lb
= -7821 cal/g = -32.7 × 10^6 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

AAN n-AMYL ALCOHOL

Common Synonyms
Pentyl alcohol
1-Pentanol
n-Butylcarbinol

Liquid Colorless Mild sweet odor

Floats on water Flammable irritating vapor is produced

Stay upwind and keep out of low areas
Ventilate closed spaces before entering
Keep unnecessary people away
Isolate hazard area and deny entry
Stay away from ends of tanks
Wear self-contained breathing apparatus and rubber protective clothing
Notify local health and pollution control officials
Prevent runoff from fire control or dilution from entering streams, sewers or drinking water supply
Notify operators of downstream water intakes
Notify local authorities and pollution control agencies
Keep combustibles (wood, paper, oil, etc.) away from spilled material
Use water spray to reduce vapors or divert vapor cloud drift
Avoid all contact with liquid and vapor
Stay upwind
Keep out of low areas
Ventilate closed spaces before entering
Wear self-contained breathing apparatus and rubber protective clothing
Do not get water inside containers
Cool containers with flooding quantities of water until well after fire is out
Withdraw immediately in case of rising sound from venting safety device or discoloration of tank
Stay away from ends of tanks

Fire

FLAMMABLE.
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemical, alcohol foam, carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing, nausea, headache, or difficult breathing
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to eyes
Harmful if swallowed
Not irritating to skin

Flush affected areas with plenty of water
IF IN EYES, hold eyelid open and flush with a steady stream of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and pollution control officials
Notify operators of downstream water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
1-Amylalcohol
n-Butylcarbinol
1-Pentanol
Pentyl alcohol

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $CH_3(CH_2)_3CH_2OH$

3.4 **IMCO United Nations Numerical Designation.** 3.2 1105

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like alcohol causes coughing

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Face splash shield, goggles, protective clothing, and cartridge respirator

5.2 **Symptoms Following Exposure:** Irritation to skin, eyes and respiratory tract, headache and vertigo, dyspnea and cough, nausea, vomiting and diarrhea. Drowsiness, deafness, delirium and occasionally fatal poisoning preceded by severe nervous symptoms, have been reported. Coma, glycosuria and methemoglobinemia can occur.

5.3 **Treatment for Exposure:** SKIN: remove chemical by thorough washing with soap and water. EYES: wash promptly with large quantities of water for at least 15 min. Call a doctor.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** 150 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2, 1 Dg/Kg to 5 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5.10 **Odor Threshold:** 0.12 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** 77°F C.C.

6.2 **Flammable Limits in Air**
1.2 - ?

6.3 **Fire Extinguishing Agents.** Alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 680°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not measurable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 1.55 % 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Allegheny Ludlum Corp.
Specialty Chemicals Division
Marcus Hook, Pa. 19061

2. Exxon Chemical Company
Baton Rouge, La. 70821

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 98% - 74 plus % 2-methyl-1-butanol

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open dome or pressure

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Another Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 88.1

13.3 **Boiling Point at 1 atm:** 280.2°F = 137.9°C = 411.1°K

13.4 **Freezing Point:** -110°F = -79°C = 194°K

13.5 **Critical Temperature:** 595°F = 313°C = 586°K

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.8144 at 15°C (liquid)

13.8 **Liquid Surface Tension:** 25.60 dynes/cm = 0.2560 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 5 dynes/cm = 0.005 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.06

13.12 **Latent Heat of Vaporization:** 217.1 Btu/lb = 120.6 cal/g = 5049 J/g

13.13 **Heat of Combustion:** -16,500 Btu/lb = -9170 cal/g = -376.8 x 10³ J/g

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5-445.1

NOTES

AMY	n-AMYL CHLORIDE

Common Synonyms
Amyl chloride
1-Chloropentane
n-Butylcarbinyl chloride
1-Pentyl chloride
Chloride of amyl

Liquid | Colorless to purple | Pleasant odor

Floats on water | Flammable vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Irritating gases may be produced when heated

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Mechanical containment
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Amyl chloride, Chloropentane, n-Butylcarbinyl chloride, Pentyl chloride, Chloride of amyl

3.2 **Coast Guard Compatibility Classification:** Halogenated compounds (5)

3.3 **Chemical Formula:** $CH_3CH_2CH_2CH_2CH_2Cl$

3.4 **IMCO/United Nations Numerical Designation:** 1107

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless straw deep purple

4.3 **Odor:** Aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles or face shield; rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes mild irritation of mucous membranes. Ingestion of liquid or contact with vapor or eyes causes mild irritation.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air; apply artificial respiration if required. EYES: flush with water. SKIN: wash well with soap and water. INGESTION: induce vomiting; give water.

5.4 **Toxicity by Inhalation, (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ Not 2.15 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 95°F (35°C) CC

6.2 **Flammable Limits in Air:** 1.4 - ? %

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride and toxic phosgene may be formed in fires

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 900°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Not reactive

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

2. Lachat Chemicals, Inc.
20936 Ashland Avenue
Chicago Heights, Ill. 60411

3. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

ATU

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 106.6

13.3 **Boiling Point at 1 atm:**
226°F = 108°C = 381°K

13.4 **Freezing Point:**
-136°F = -99°C = 174°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.8834 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
24.9 dynes/cm = 0.0249 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
reg 1.35 dynes/cm = 0.015 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 3.7

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.0650

13.12 **Latent Heat of Vaporization:**
132.1 Btu/lb = 73.45 cal/g
= 3.073 × 10^5 J/kg

13.13 **Heat of Combustion:** -13,500 Btu/lb
= -7500 cal/g = -314 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

AMM

n-AMYL MERCAPTAN

Common Synonyms
1-Pentanethiol
Amyl hydrosulfide
Amyl sulfhydrate
Amyl thioalcohol

Liquid | Colorless to yellow | Strong garlic odor

Floats on water. Flammable vapor is produced.

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Containers may explode in fire.

Exposure

VAPOR

LIQUID
Irritating to skin and eyes.

Water Pollution

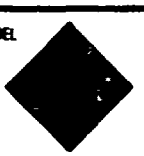
Effect of low concentrations on aquatic life is unknown.
Foaming in shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-448-4)

Hazard rating: high flammability
Mechanical containment
Should be recovered
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Pentanethiol, Amyl hydrosulfide, Amyl sulfhydrate, Amyl thioalcohol

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_3CH_2CH_2CH_2CH_2SH$

3.4 **IMCO/United Nations Numerical Designation:** 12 1071

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless, water white to yellow

4.3 **Odor:** Strong offensive garlic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Plastic gloves, goggles

5.2 **Symptoms Following Exposure:** Inhalation may cause nausea because of offensive odor; contact with eyes or skin causes slight irritation. Ingestion may cause vomiting.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air; apply artificial respiration if required. EYES: wash with water; see a physician. SKIN: wash with soap and water. INGESTION: induce vomiting if the does not involve unconsciousness.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 0.3 mg/m³

6. FIRE HAZARDS

6.1 **Flash Point:** 0°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Sulfur dioxide gas is formed

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Pennsalt Corporation
   Industrial Chemicals Department
   Three Parkway
   Philadelphia, Pa. 19102
2. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650
3. Aldrich Chemical Co.
   940 West St. Paul Ave.
   Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 96.0+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-448-3)

S T 1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 104.2

13.3 **Boiling Point at 1 atm:** 244°F = 120°C = 393°K

13.4 **Freezing Point:** −104°F = −76°C = 197°K

13.5 **Critical Temperature:** 610°F = 321°C = 594°K

13.6 **Critical Pressure:** 508 psia = 34.5 atm = 3.50 MN/m²

13.7 **Specific Gravity:** 0.8392 at 25°C (liquid)

13.8 **Liquid Surface Tension:** 26.8 dynes/cm = 0.0268 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 3.59

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0622

13.12 **Latent Heat of Vaporization:** 171 Btu/lb = 94.9 cal/g = 3.97 × 10² J/kg

13.13 **Heat of Combustion:** −17,070 Btu/lb = −9,480 cal/g = −3.97 × 10² J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

AMK	n-AMYL METHYL KETONE

Methyl amyl Ketone
2-Heptanone
2-Acetylpentane
Methyl pentyl Ketone
Pentyl methyl ketone

Liquid | White | Penetrating fruity odor

Floats and mixes slowly with water

Fire

Combustible

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause dizziness, headache, or difficult breathing

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting

Water Pollution

Effects of low concentrations on aquatic life is unknown
Foaming in shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Isolate warning water containment
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Heptanone, 2-Ketoheptane, Methyl amyl ketone, Methyl pentyl ketone, Pentyl methyl ketone

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_3CH_2CH_2CH_2CCH_3O$

3.4 **IMCO/United Nations Numerical Designation:** 1110

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Gloves and goggles

5.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may have narcotic effect. Ingestion causes gastrointestinal disturbances. Contact with eyes causes irritation. Prolonged and repeated contact with skin may cause defatting with resultant irritation.

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give medical attention. EYES: flush with water for 15 to 20 min. SKIN: flush affected areas with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm suggested

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 650 mg/kg (rats)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 0.037 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 109°F (C.C.) (42.8°C)

6.2 **Flammable Limits in Air:** 1.1% - 7.9%

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Will attack some forms of plastic

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0.5% in 10 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Chemical Products Inc.
Industrial Chemicals Div.
Kingsport, Tenn. 37662

2. Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

3. Fluka and Buchs Inc.
126 Old Northern Blvd.
Flushing, N.Y. 11358

10. SHIPPING INFORMATION

*10.1 **Grades of Purity:** Technical, Pure

*10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Nonpressurized material

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

N.A.S.

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

*12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 114.19

13.3 **Boiling Point at 1 atm:** 304.7°F = 151.5°C = 424.7°K

13.4 **Freezing Point:** -31°F = -35°C = 238°K

13.5 **Critical Temperature:** Data not available

*13.6 **Critical Pressure:** Data not available

13.7 **Specific Gravity:** 0.8204 at 15°C (liquid)

*13.8 **Liquid Surface Tension:** 26.17 dynes/cm = 0.02617 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:** 12.4 dynes/cm = 0.0124 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** 3.94

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.05

13.12 **Latent Heat of Vaporization:** 144.9 Btu/lb = 82.7 cal/g = 3.45 x 10^2 J/g

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7-AMK-2)

NOTES

ANT

n-AMYL NITRATE

Common Synonyms
Mixed primary amyl nitrates
Diesel ignition improver

Liquid | Colorless to light straw | Ether like odor

May float or sink in water

Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Shut off ignition sources. Call fire department.
Stay upwind. Use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
May explode if exposed to heat or flames

Wear goggles and self contained breathing apparatus.
Extinguish with dry chemicals, foam, water or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache

If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea or headache

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: air contaminant
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** Diesel ignition improver, Mixed primary amyl nitrates
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** $C_5H_{11}ONO_2$
3 4 **IMCO/United Nations Numerical Designation:** 3 3/1112

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Light straw, water white
4 3 **Odor** Ethereal

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirator with canister for vapors at high concentrations
5 2 **Symptoms Following Exposure:** Inhalation or ingestion may cause headache, methemoglobin and nausea. Liquid and vapor irritate eyes. Contact with skin may cause slight irritation.
5 3 **Treatment for Exposure.** INHALATION: move to fresh air, support respiration, get medical attention. INGESTION: induce vomiting, get medical attention. EYES: irrigate thoroughly with water. SKIN: wash with soap and water.
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** 120°F O C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:**
6 5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen may form in a fire
6 6 **Behavior in Fire:** Overheated material may detonate
6 7 **Ignition Temperature** Data not available
6 8 **Electrical Hazard** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** May form combustible mixture with wood or other combustibles. Liquid will attack some plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Ethyl Corporation
Industrial Chemicals Div
451 Florida St
Baton Rouge, La 70801

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Mixture containing n-amyl nitrate 60%, iso-amyl nitrate 5%, 2 methylbutyl nitrate 35%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1-U X Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	1	2
Flammability (Red)	2	2
Reactivity (Yellow)	0	0
	oxy	oxy

*First column refers to nonfire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 133
13 3 **Boiling Point at 1 atm** 292 314°F = 144 156°C = 417 429°K
13 4 **Freezing Point.** −190°F = −123°C = 150°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 0 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** 4 59
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Data not available
13 13 **Heat of Combustion.** Data not available
13 14 **Heat of Decomposition:** Data not available
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

iso-AMYL NITRITE

CG Common Synonyms

Isopentyl estrite
Amyl nitrite
3-Methylbutyl nitrite

Liquid | Colorless to light yellow | Pleasant fruity odor

Floats on water. Poisonous gas is produced on contact with water.

Shut off ignition sources. Call fire department.
Wear goggles, self-contained breathing apparatus and rubber overclothing.
Ventilate area.
Avoid contact with liquid. Keep upwind.
Stop discharge if possible.
Isolate and remove the spilled material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE

POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
DO NOT USE WATER ON FIRE
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
If swallowed will cause dizziness, headache or loss of consciousness
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (two glasses at most).
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and pollution control agencies.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Isopentyl nitrite
Amyl nitrite
3-Methylbutyl nitrite

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula.** $(CH_3)_2CHCH_2CH_2ONO$

3.4 **IMCO/United Nations Numerical Designation.** 3.1/1113

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Light yellow, transparent

4.3 **Odor:** Pleasant, fragrant, fruity

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles or face shield, self contained breathing apparatus, protective gloves and clothing

5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes flushing of the face, pulsatile headache, disturbing tachycardia, cyanosis (methemoglobinemia), weakness, confusion, restlessness, faintness, and collapse. Contact with eyes or skin causes irritation.

5.3 **Treatment for Exposure:** INHALATION or INGESTION: place patient in recumbent position, if necessary, administer oxygen. For treatment of severe methemoglobinemia: transfuse with whole blood or give I.V. or I.M. a dose of 1.2 mg/kg methylene blue or an oral dose of 3.5 mg/kg. EYES: after contact with liquid, irrigate with large quantities of water for 15 min., call physician. SKIN: after contact with liquid, wash with large amounts water. Call physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1; LD_{50} 5 to 15 g/kg

5.7 **Late Toxicity:** Methemoglobinemia may occur

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 0°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen are formed

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** 410°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Decomposes on exposure to air, light, or water, evolving toxic oxides of nitrogen which are orange in color

7.2 **Reactivity with Common Materials:** May corrode metals if wet

7.3 **Stability During Transport:** Stable if kept sealed and not exposed to light

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

2 Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

3 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, USP

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T U V W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 117.1

13.3 **Boiling Point at 1 atm:** 210°F = 99°C = 372°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.8758 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** (est.) 40 dynes/cm = 0.040 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.0709

13.12 **Latent Heat of Vaporization:** 212 Btu/lb = 118 cal/g = 4.94×10^5 J/kg

13.13 **Heat of Combustion:** −12 500 Btu/lb = −6 930 cal/g = -290×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ATS

n-AMYLTRICHLOROSILANE

Common Synonyms
Trichloropentylsilane
Pentylsilicon trichloride
Trichloroamylsilane

Liquid | Colorless | Sharp irritating odor

Reacts violently with water. Irritating visible vapor cloud is produced.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus and rubber protective clothing, gloves.
Stop discharge if possible.
Call fire department.
Isolate and remove unmanned material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals or carbon dioxide.
DO NOT USE WATER OR FOAM ON FIRE.

Exposure

Call for medical aid.

VAPOR

Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

Will burn skin and eyes
Harmful if swallowed

Remove contaminated clothing, shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold lids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of public water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Trichloropentylsilane
Pentylsilicon trichloride
Trichloroamylsilane

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $CH_3CH_2CH_2CH_2CH_2SiCl_3$

3 4 **IMCO/United Nations Numerical Designation.** 8/1728

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Sharp, like hydrochloric acid pungent acrid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Acid vapor type respiratory protection, rubber gloves, chemical worker's goggles

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane. Contact of liquid with eyes or skin causes severe burns, and ingestion causes severe burns of mouth and stomach.

5 3 **Treatment for Exposure:** Get medical attention immediately after exposure to this compound. INHALATION: remove from exposure, support respiration. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: give large amounts of water.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 2,340 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

5 9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 145°F O.C.

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water, foam

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride and toxic phosgene may be formed.

6 6 **Behavior in Fire.** Difficult to extinguish. Re-ignition may occur.

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 2.5 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously to generate toxic hydrogen chloride gas (hydrochloric acid)

7 2 **Reactivity with Common Materials:** Corrodes metal

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** After flushing with water, rinse with sodium bicarbonate solution or lime water.

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2 Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640

3 PCR, Inc.
P.O. Box 1466
Gainesville, Fla. 32601

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	4
Self Reaction	1

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 205.6

13 3 **Boiling Point at 1 atm.**
320°F = 160°C = 433°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.147 at 25°C (liquid)

13 8 **Liquid Surface Tension:**
(est.) 20 dynes/cm = 0.020 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** ?

13 11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13 12 **Latent Heat of Vaporization:**
(est.) 86.8 Btu/lb = 48.2 cal/g
= 2.02×10^5 J/kg

13 13 **Heat of Combustion:** (est.) −6,630 Btu/lb
= −3,680 cal/g = -1.54×10^7 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** (est.) 180 Btu/lb
= 100 cal/g = 4.6×10^5 J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

ANL

ANILINE

Common Synonyms
Aminobenzene
Aniline oil
Phenylamine
Blue oil

Oily liquid | Colorless to yellowish brown | Weak odor

Sinks slowly in water

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GAS IS PRODUCED WHEN HEATED.
Vapor may explode if ignited in an enclosed area.
Wear chemical protective suit with self-contained breathing apparatus.
Extinguish with water, dry chemical, foam or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Irritating to eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - poison, water contaminant.
Restrict access.
Should be removed.
Chemical and physical treatment.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Aminobenzene
Aniline oil
Blue oil
Phenylamine

3.2 **Coast Guard Compatibility Classification.**
Aromatic amine

3.3 **Chemical Formula:** $C_6H_5NH_2$

3.4 **IMCO/United Nations Numerical Designation:** 6.1, 1547

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale brown

4.3 **Odor:** Aromatic amine, like characteristic peculiar, strongly amine like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Respirator for organic vapors, splashproof goggles, rubber gloves, boots.

5.2 **Symptoms Following Exposure:** ACUTE EXPOSURE: Blue discoloration of finger tips, cheeks, lips and nose, nausea, vomiting, headache and drowsiness followed by delirium, coma and shock. CHRONIC EXPOSURE: Loss of appetite, loss of weight, headaches, visual disturbances, skin lesions.

5.3 **Treatment for Exposure:** Remove victim to fresh air and call a physician at once. SKIN EYE CONTACT: immediately flush skin or eyes with plenty of water for at least 15 min. If excessive is present, shower with soap and warm water, with special attention to scalp and fingernails. Administer oxygen until physician arrives.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits.** 50 ppm for 30 min; 5 ppm for 8 hr

5.6 **Toxicity by Ingestion:** Grade 3, LD_{50} 50 to 500 mg/kg

5.7 **Late Toxicity:** None recognized

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics.** If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.5 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 160°F (O.C.), 158°F (C.C.)

6.2 **Flammable Limits in Air:** 1.3% (U.L.)

6.3 **Fire Extinguishing Agents.** Water, foam, dry chemical or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.

6.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated.

6.6 **Behavior in Fire:** Not pertinent.

6.7 **Ignition Temperature:** 1418°F

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** 3.0 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.

7.2 **Reactivity with Common Materials:** No reaction.

7.3 **Stability During Transport:** Stable.

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water and rinse with dilute acetic acid.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
1020 ppm/1 hr/catfish/killed/fresh water
10 ppm/96 hr/goldfish/killed/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
1.5% 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Baychem Corp.
Mobay Chemical Co. Division
Penn Lincoln Pkwy. West
Pittsburgh, Pa. 15205

2. E. I. duPont de Nemours and Co.
Explosives Department
Wilmington, Del. 19898

3. First Mississippi Corp.
First Chemical Corp.
Pascagoula, Miss. 39567

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial 99.5%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-P-Q-T-U-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	4
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight.** 93.13

13.3 **Boiling Point at 1 atm:**
363.6°F = 184.2°C = 457.4°K

13.4 **Freezing Point**
21.1°F = -6.1°C = 267.1°K

13.5 **Critical Temperature**
798.1°F = 425.6°C = 698.8°K

13.6 **Critical Pressure:**
770 psia = 52.4 atm = 5.31 MN/m²

13.7 **Specific Gravity:** 1.022 at 20°C (liquid)

13.8 **Liquid Surface Tension**
45.5 dynes/cm = 0.0455 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
5.8 dynes/cm = 0.0058 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1

13.12 **Latent Heat of Vaporization:**
198 Btu/lb = 110 cal/g = 4.61 × 10⁵ J/kg

13.13 **Heat of Combustion:** -14,940 Btu/lb = -8320 cal/g = -348.3 × 10⁵ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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ANISOYL CHLORIDE

Common Synonyms
p-Anisoyl chloride

Liquid Yellow to brown Sharp penetrating odor

Reacts with water Irritating vapor is produced Freezing point is 72°F

Wear goggles and self-contained breathing apparatus
Stop discharge if possible Keep people away
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Extinguish with dry chemicals carbon dioxide
DO NOT USE WATER ON ADJACENT FIRES

Exposure

Call for medical aid

VAPOR
Irritating to eyes nose and throat
Move victim to fresh air
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning corrosive
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** p-Anisoyl chloride
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula** p-CH$_3$OC$_6$H$_4$COCl
3 4 **IMCO/United Nations Numerical Designation.** 9 1/2

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color.** Yellow-brown
4 3 **Odor.** Sharp penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles and face shield plastic gloves protective clothing
5 2 **Symptoms Following Exposure** Vapor irritates mucous membranes Contact of liquid with eyes or skin causes severe irritation Ingestion causes severe irritation of mouth and stomach
5 3 **Treatment for Exposure** INHALATION remove to fresh air EYES flush with water for at least 15 min get medical attention SKIN flush with water wash well with soap and water INGESTION do NOT induce vomiting give large amounts of water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents** Carbon dioxide dry chemical
6 4 **Fire Extinguishing Agents Not to be Used** Water foam
6 5 **Special Hazards of Combustion Products** Irritating hydrogen chloride fumes may be formed
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Reacts slowly to generate hydrogen chloride (hydrochloric acid) The reaction is not hazardous
7 2 **Reactivity with Common Materials.** Corrodes metal slowly
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Eastman Kodak Co
Eastman Organic Chemicals
Rochester N Y 14650

2 Aldrich Chemical Co
940 West St Paul Avenue
Milwaukee Wis 53233

3 Pfaltz and Bauer Inc
126-04 Northern Boulevard
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

X O X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 171 6
13 3 **Boiling Point at 1 atm:** 504°F = 262°C = 535°K
13 4 **Freezing Point** 72°F = 22°C = 295°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity** 1 25 at 20°C (liquid)
13 8 **Liquid Surface Tension.** (est) 25 dynes/cm = 0 025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** (est) −10 500 Btu/lb = −5 830 cal/g = −244 × 10^3 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** (est) 90 Btu/lb = 50 cal/g = 2 1 × 10^3 J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 4 and 5)

NOTES

ATH

ANTHRACENE

Common Synonyms
Anthracin
Paranaphthalene
Green oil

Solid | White to yellow | Weak aromatic odor

Sinks in water

Stop discharge if possible keep people away
Avoid contact with solid and [illegible]
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Dust cloud may explode if ignited in an enclosed area
Extinguish with water dry chemical foam or carbon dioxide

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If in eyes hold eyelids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Anthracin Green oil Paranaphthalene
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula.** $C_{14}H_{10}$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White to yellow
4 3 **Odor:** Weak aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat Contact with eyes causes irritation
5 3 **Treatment for Exposure:** INHALATION move to fresh air EYES flush with water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used**
6 5 **Special Hazards of Combustion Products.**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** 1004°F
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 5 ppm 24 hr trout & bluegill no effect
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

2 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee, Wis 53233

3 Eastman Organic Chemicals
Rochester N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Various fluorescence grades, Scintillation grade Technical grade, 90 98%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 178.23
13 3 **Boiling Point at 1 atm:** 646.2°F = 341.2°C = 614.4°K
13 4 **Freezing Point:** 421.7°F = 216.5°C = 489.7°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.24 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** −17,100 Btu/lb = −9 510 cal/g = −398 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

APC

ANTIMONY PENTACHLORIDE

Common Synonyms

Antimony (V) chloride
Antimony perchloride

Liquid | Colorless to brown | Unpleasant odor

Soaks in water. Irritating vapor is produced. Freezing point is 37° F.

[illegible]

Fire

Not flammable.
POISONOUS GASES ARE PRODUCED WHEN HEATED.
DO NOT USE WATER ON ADJACENT FIRES.

Exposure

[illegible] medical aid.

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
[illegible]

LIQUID
Will burn skin and eyes.
If swallowed will cause nausea, vomiting or loss of consciousness.
[illegible]
IF IN EYES, [illegible] with plenty of water.
IF SWALLOWED, [illegible] CONSCIOUS, [illegible] water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Antimony (V) chloride
Antimony perchloride

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $SbCl_5$

3 4 **IMCO/United Nations Numerical Designation:** [illegible] 1730

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to medium brown, yellow red brown

4 3 **Odor:** Pungent, offensive

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor acid gas type canister mask, rubber, neoprene vinyl etc. gloves, chemical safety goggles, plus face shield where appropriate, acid resistant clothing, plus apron for splash protection, rubber safety shoes or boots, hard hat.

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe burns. Ingestion causes vomiting and severe burns of mouth and stomach. Overexposure by any route can cause bleeding, weak, slow pulse, low blood pressure, coma, convulsions, cardiac arrest.

5 3 **Treatment for Exposure:** INHALATION: remove to clean air, rinse mouth and gargle with water. If overexposure is serious, get prompt medical attention. EYES: flush eyes and eye lids thoroughly with large amounts of water, get prompt medical attention. SKIN: flush thoroughly with water, remove contaminated clothing, wash affected area with soap and water. If overexposure is serious, get prompt medical attention. INGESTION: dilute by drinking water, if vomiting occurs, administer more water. If overexposure is serious, get prompt medical attention.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ as antimony

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1,115 mg/kg (oral, 900 mg [illegible] ea pig)

5 7 **Late Toxicity:** An immunosuppressing may result

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

(Continued on page 4)

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water or foam on adjacent fires

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Irritating fumes of hydrogen chloride given off when water or foam is used to extinguish adjacent fire

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts to form hydrogen chloride gas (hydrochloric acid)

7 2 **Reactivity with Common Materials:** Causes corrosion of metal

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Soda ash or soda ash lime mixture

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Hooker Chemical Corporation
Specialty Chemicals Division
4700 Buffalo Avenue
Niagara Falls, N Y 14302

2 J T Baker Chemical Co
Phillipsburg, N J 08865

3 Mallinckrodt Chemical Works
223 West Side Avenue
Jersey City, N J 07304

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99+ %

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	3
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not Listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 299.05

13 3 **Boiling Point at 1 atm:**
[illegible] 347°F = 175°C = 448°K

13 4 **Freezing Point:** [illegible] 3 C = [illegible]°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.354 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
test) 15 dynes/cm = 0.015 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 68.9 Btu/lb = 38.3 cal/g = 1.60 × 10⁵ J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** −211.9 Btu/lb = −117.7 cal/g = −4.92 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

5. HEALTH HAZARDS (Cont'd.)

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant, causes second and third-degree burns on short contact and is very injurious to the eyes

5 10 **Odor Threshold:** Data not available

APF ANTIMONY PENTAFLUORIDE

Common Synonyms

Liquid | Colorless | Sharp odor

Reacts violently with water. Poisonous gas is produced on contact with water. Freezing point is 45° F.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles and self-contained breathing apparatus.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
May cause fire on contact with combustibles.
POISONOUS GASES ARE PRODUCED WHEN HEATED.
DO NOT USE WATER OR FOAM ON FIRE OR ON ADJACENT FIRES.
Extinguish with dry chemicals or carbon dioxide.

Exposure

CALL FOR MEDICAL AID.

VAPOR

POISONOUS IF INHALED.
Irritating to eyes, nose and throat.
Move victim to fresh air.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

POISONOUS IF SWALLOWED.
Will burn skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning; contain air contaminant.
Restrict access.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms.
3.2 **Coast Guard Compatibility Classification:** Not applicable.
3.3 **Chemical Formula:** SbF_5
3.4 **IMCO/United Nations Numerical Designation:** No. 1732.

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid.
4.2 **Color:** Colorless.
4.3 **Odor:** Pungent.

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid gas type canister mask; rubber gloves; protective clothing; safety goggles and face shield.
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe burns. Ingestion causes vomiting and severe burns of mouth and throat. Overexposure by any route can cause bloody stools, slow pulse, low blood pressure, coma, convulsions, cardiac arrest.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, rinse mouth with water, give oxygen if necessary to assist breathing, get medical attention. EYES: irrigate with copious amounts of water for at least 15 min., get medical attention. SKIN: flush with copious amounts of water, wash well with soap and water. INGESTION: dilute by drinking water if vomit has not occurred, drink more water, get medical attention promptly.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ as antimony.
5.5 **Short-Term Inhalation Limits:** Data not available.
5.6 **Toxicity by Ingestion:** Data not available.
5.7 **Late Toxicity:** Antimony poisoning may result.
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available.
5.9 **Liquid or Solid Irritant Characteristics:** Data not available.
5.10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable (but see 2).
6.2 **Flammable Limits in Air:** Not flammable.
6.3 **Fire Extinguishing Agents:** Not pertinent.
6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water or foam on adjacent fires.
6.5 **Special Hazards of Combustion Products:** Not pertinent.
6.6 **Behavior in Fire:** Gives off toxic hydrogen fluoride fumes when water is used to extinguish adjacent fire.
6.7 **Ignition Temperature:** Not pertinent.
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** Not pertinent.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously to form toxic hydrogen fluoride (hydrofluoric acid).
7.2 **Reactivity with Common Materials:** When moisture is present, causes severe corrosion of metals (except steel) and glass. If confined and wet can cause explosion. May cause fire in contact with combustible material.
7.3 **Stability During Transport:** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD):** None.
8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

Ozark-Mahoning Company
Special Chemicals Division
1870 South Boulder
Tulsa, Okla. 4119

2 Ventron Corp.
Alfa Products Division
P. O. Box 159
Beverly, Mass. 01915

3 PCR Inc.
P. O. Box 1466
Gainesville, Fla. 32602

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial.
10.2 **Storage Temperature:** Ambient.
10.3 **Inert Atmosphere:** No requirement.
10.4 **Venting:** Pressure vacuum.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive.
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.
12.3 **NFPA Hazard Classifications:** Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid.
13.2 **Molecular Weight:** 216.7
13.3 **Boiling Point at 1 atm.:** 289°F = 143°C = 416°K.
13.4 **Freezing Point:** 45°F = 7°C = 280°K.
13.5 **Critical Temperature:** Not pertinent.
13.6 **Critical Pressure:** Not pertinent.
13.7 **Specific Gravity:** 2.340 at 30°C (liquid).
13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C.
13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
13.12 **Latent Heat of Vaporization:** (est.) 179 Btu/lb = 44 cal/g = 1.9 × 10⁵ J/kg.
13.13 **Heat of Combustion:** Not pertinent.
13.14 **Heat of Decomposition:** Not pertinent.
13.15 **Heat of Solution:** Data not available.
13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

APT	ANTIMONY POTASSIUM TARTRATE

Common Synonyms
Tartar emetic
Tartrated antimony
Tartarized antimony
Potassium antimonyl tartrate

Solid White Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator, rubber coveralls, and rubber gloves
Stop discharge if possible
Isolate and limit access to discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause dizziness, headache, coughing, or difficult breathing
In case of contact, immediately flush skin with plenty of water
If dust in eyes, wash out with plenty of water
If dust on clothing, remove clothing

SOLID
Will burn skin and eyes
If swallowed will cause nausea, dizziness, loss of consciousness
In case of contact, immediately flush skin with plenty of water
IF IN EYES, flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water
Induce vomiting and repeat flushing
IF SWALLOWED and victim is NOT CONSCIOUS OR HAVING CONVULSIONS
Do not induce vomiting; keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify public if on land or in water
Notify operators of water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4)

Issue warning: prevent use of contaminant
Restrict access
Dispose of flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Potassium antimonyl tartrate, Tartar emetic, Tartrated antimony, Tartarized antimony

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $KOOC\,CHOH\,CHOH\,COOSbO \cdot \frac{1}{2}H_2O$

3.4 **IMCO/United Nations Numerical Designation:** No. 1551

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, rubber or plastic coated gloves, chemical goggles, tight work clothing, Bu. Mines approved respirator

5.2 **Symptoms Following Exposure:** Inhalation causes inflammation of membranes of nose and throat, upper respiratory irritation, headache, dizziness. Ingestion causes gastrointestinal upset, nausea, vomiting, diarrhea. Contact with eyes or skin causes irritation. Further symptoms of overexposure include nervous complaints of irritability, dizziness, muscular and neuralgic pains

5.3 **Treatment for Exposure:** INHALATION of material or DECOMPOSITION call physician immediately. If victim is conscious, administer 2 glasses of water to dilute material in stomach. EYES: flush with water for 15 minutes, call physician. SKIN: flush with water, wash well with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as antimony)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, oral rat LD_{50} = 115 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents.** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire.**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
20 ppm* /96 hr. fathead minnow TL$_m$ fresh (soft) water
12 ppm* /96 hr. fathead minnow TL$_m$ fresh (hard) water
*as antimony

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** High

9 SELECTED MANUFACTURERS

1. Pfizer Chemicals Div
235 E 42nd St
New York, N.Y. 10017
2. The Harshaw Chemical Co
1945 E 97th St
Cleveland, Ohio 44106
3. Mallinckrodt Chemical Works
223 Westside Ave
P.O. Box 334
Jersey City, N.J. 07303

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure 99 - 100%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
ORM - A

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 434

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.60 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 4 and 5

NOTES

ATM

ANTIMONY TRICHLORIDE

Common Synonyms
Butter of antimony
Antimony (III) Chloride

Solid White to pale yellow Sharp unpleasant odor

Smks and mixes violently with water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear dust respirator and rubber overclothing including gloves
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Irritating gases may be produced when heated.
Wear goggles and self-contained breathing apparatus
CONTACT WATER ON SIDE OF FIRE

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing, or difficult breathing.
If in eyes flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
Will burn skin and eyes.
If swallowed will cause nausea, vomiting or loss of consciousness.
Remove contaminated clothing at once
Flush affected areas with plenty of water
IF EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS induce vomiting by drinking warm water
IF SWALLOWED and victim is UNCONSCIOUS or convulsing DO NOTHING except keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
corrosive
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Antimony butter
Antimony (III) chloride
Butter of antimony

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $SbCl_3$

3.4 **IMCO/United Nations Numerical Designation:** 1733

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White to pale yellow

4.3 **Odor:** Sharp acrid

5 HEALTH HAZARDS

Note *The respiratory system is the chief avenue of entrance of antimony and its compounds into the body.*

5.1 **Personal Protective Equipment:** Bu Mines approved respirator, chemical safety goggles or shield, leather or rubber safety shoes, rubber apron, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation of small amounts may cause irritation of the nose, throat and air passages, large exposures result in severe air passage irritation. Ingestion causes vomiting, purging with bloody stools, skin pulse and low blood pressure, slow shallow breathing, coma and convulsions, sometimes followed by death. Contact with eyes causes severe eye burns or at least severe eye irritation. Contact of dry chemical with skin may result in deep chemical burns.

5.3 **Treatment for Exposure:** INHALATION remove victim at once to fresh air and keep him warm but not hot, call a physician immediately, nasal passages may be irrigated from a gentle flowing hose. INGESTION induce vomiting by giving large quantities of warm salt water, have a physician see the patient at once. EYES flush with copious amounts of water for at least 15 minutes, call physician at once. SKIN flush with large quantities of flowing water followed by washing of skin surfaces with soap and water, remove all contaminated clothing promptly.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ as antimony

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 0.75 mg/kg

(Continued on page 4)

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:**
Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:**
Do not use water on adjacent fires

6.5 **Special Hazards of Combustion Products:**
Toxic and irritating antimony oxide and hydrogen chloride may form in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously to form a strong solution of hydrochloric acid

7.2 **Reactivity with Common Materials:**
Corrodes most metals in presence of moisture. Flammable hydrogen gas may collect in enclosed spaces

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Large amounts of water followed by sodium bicarbonate or soda ash solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
17 ppm* 96 hr fathead minnow TL_m fresh (hard) water
9 ppm* 96 hr fathead minnow TL_m fresh (soft) water
*as antimony

8.2 **Waterborne Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):**
Data not available

8.4 **Food Chain Concentration Potential:**
High

9. SELECTED MANUFACTURERS

1. J T Baker Chemical Co
Phillipsburg, N J 08855
2. Stauffer Chemical Company
Specialty Chemical Division
Westport, Conn 06880
3. Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99+%
Analytical, Anhydrous

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Padded

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

RR

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Corrosive solid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
Solid

13.2 **Molecular Weight:** 228

13.3 **Boiling Point at 1 atm:**
433°F = 223°C = 496°K

13.4 **Freezing Point:**
163°F = 73°C = 346°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 3.14 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization:**
Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** −70 Btu/lb
= −39 cal/g = −1.6 x10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

5 HEALTH HAZARDS (Cont'd)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

ATT

ANTIMONY TRIFLUORIDE

Common Synonyms	Solid crystals	White	Odorless
	Sinks in water		

As a result of contact with s.t.
Isolate and remove discharged materials.
Notify local health and pollution control agencies.

Fire

No flammable

Exposure

CALL FOR MEDICAL AID

SOLID
Irritating to skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, induce vomiting. CONSULT PHYSICIAN. Give victim plenty of water to drink.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** SbF_3
3.4 **IMCO United Nations Numerical Designation:** 6.1 1549

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved respirator, rubber gloves
5.2 **Symptoms Following Exposure:** Resemble those of lead and arsenic poisoning. ACUTE POISONING: irritation of the mouth, nose, stomach and intestines, vomiting, purging with bloody stools, slow pulse and low blood pressure, slow, shallow breathing, coma and convulsions sometimes followed by death from cardiac and respiratory exhaustion. CHRONIC POISONING: dryness of throat, pain on swallowing, occasional vomiting and persistent nausea, susceptibility to fainting, diarrhea, loss of appetite and weight, giddiness, dermatitis, either pustular or ulcerative, anemia
5.3 **Treatment for Exposure:** If any symptoms, however slight, are noticed, the affected individual should be removed from contact with the chemical and placed under the care of a physician who is versed in the treatment necessary.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 3. LD$_{50}$ 50 to 500 mg/kg (guinea pig)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 300 ppm/24 hr/fish/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Specialty Chemicals Div.
Wilmington, Delaware
Marcus Hook, Pa. 19061
2. Ozark-Mahoning Co.
1870 South Boulder Ave.
Tulsa, Oklahoma 74119

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 98%
10.2 **Storage Temperature:** Data not available
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 178.76
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** 448°F = 292°C = 565°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 4.38 at 21°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 4 and 5

NOTES

REVISED 1978

ATX	# ANTIMONY TRIOXIDE

Common Synonyms
Dantimony trioxide
Senarmontite
Valentinite
Exitelite
Weissspiessglanz

Solid | White | Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear SCBA and rubber overclothing and gloves.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing, difficult breathing or loss of consciousness.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
If swallowed will cause dizziness, nausea, vomiting or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - person
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dantimony trioxide
Exitelite
Flowers of antimony
Senarmontite
Valentinite
Weissspiessglanz

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** Sb_2O_3

3.4 **IMCO/United Nations Numerical Designation:** 6.1 1549

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, safety goggles, dust mask

5.2 **Symptoms Following Exposure:** Inhalation causes inflammation of upper and lower respiratory tract including pneumonitis. Ingestion causes irritation of the mouth, throat, stomach and intestines, vomiting, purging with bloody stools, slow pulse and low blood pressure, slow shallow breathing, coma and convulsions, sometimes followed by death. Contact with eyes causes conjunctivitis. Contact with skin causes dermatitis and thirsty.

5.3 **Treatment for Exposure:** *If any of the symptoms of poisoning given right are noticed, the affected individual should be removed from contact with the chemical and placed under observation.* INGESTION: induce vomiting. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as antimony)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 0, oral rat LD_{50} = 20,000 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** >80 ppm/48 hr/Bluegill/soft water; >1 ppm/48 hr/Bluegill/hard or soft fresh water; Practically nontoxic

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** High

9. SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865

2. McKesson Chemical Co.
1200 Terminal Tower
Cleveland, Ohio 44113

3. Gallard-Schlesinger Chemical Mfg. Co.
584 Mineola Ave.
Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Reagent, 99+%
Optical grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

H*

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 291.50

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 5.2 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

ASA	ARSENIC ACID

Common Synonyms			
Orthoarsenic acid Arsenic peroxide	Solid crystals or solution	White or colorless	Odorless
	Sinks and mixes with water. Freezing point is 95° F		

AVOID CONTACT WITH SOLUTION, SOLID AND DUST
KEEP PEOPLE AWAY
Wear rubber coveralls, including gloves
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air
If in eyes, hold eyelids open and flush with plenty of water
Breathing artificially if victim is not breathing
SOLUTION OR SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water, milk of milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: potable water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Arsenic peroxide
Orthoarsenic acid

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $As_2O_5 \cdot xH_2O$
$H_3AsO_4 \cdot \frac{1}{2}H_2O$

3.4 **IMCO/United Nations Numerical Designation:** No. 1553

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid, a concentrated water solution is sometimes shipped

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Calamine lotion and zinc oxide powder on burns and other skin areas, rubber gloves, U. S. Bureau of Mines approved dust respirator

5.2 **Symptoms Following Exposure:** Ingestion causes irritation, stomach weakness, other gastrointestinal symptoms. Overdose can cause uremia, poisoning. Not symptoms are delayed

5.3 **Treatment for Exposure:** Get medical attention after all exposures to this compound. Be alert for uremia, poisoning symptoms. SKIN: wash well with soap and water. INGESTION: induce vomiting, drink freely lime water, milk or raw egg, give cathartic

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ as As

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 48 mg/kg (rat)

5.7 **Late Toxicity:** Arsenic compounds may be carcinogenic

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are concentrating to eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Will corrode metal and may give off toxic arsenic gas

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co.
Phillipsburg, N. J. 08865

2. Gallard-Schlesinger Chemical Manufacturing Corp.
584 Mineola Avenue
Carle Place, N. Y. 11514

3. Ceres, Inc.
13340 W. Silver Spring Rd.
Menomonee Falls, Wis. 53051

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Poison, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 229.9

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.2 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 11 Btu/lb
= 1.7 cal/g = 0.071 × 10⁻³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and A

NOTES

ARD

ARSENIC DISULFIDE

Common Synonyms
Realgar
Red arsenic glass
Red arsenic sulfide
Red orpiment
Ruby arsenic

Solid — Red brown — Odorless

Sinks in water

AVOID CONTACT OF SPILLED MATERIAL with people and animals

Fire

Not Flammable

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
Harmful to skin
SOLID
POISONOUS IF SWALLOWED
Will burn eyes and skin

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning: poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Realgar, Red arsenic glass, Red arsenic sulfide, Red orpiment, Ruby arsenic
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** As_2S_2
3.4 **IMCO/United Nations Numerical Designation:** 1557

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Red brown
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved respirator, goggles, rubber gloves, clean protective clothing
5.2 **Symptoms Following Exposure:** Acute and sub-acute poisoning are not common. Repeated inhalation causes irritation of nose, laryngitis, mild bronchitis. Ingestion causes weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, occasional hepatitis. Contact with eyes causes irritation. Irritates skin, especially where moist, if not treated may cause ulceration.
5.3 **Treatment for Exposure:** *Consult physician after all overexposure to this compound.* INHALATION: move to fresh air. INGESTION: induce vomiting by giving warm salt water, repeat until vomit is clear. EYES: flush with water for at least 15 min. SKIN: wash well with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as arsenic)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4 LD_{50} < 50 mg/kg
5.7 **Late Toxicity:** Possible skin and lung cancer
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Poisonous fumes of the compound may be formed in fires. If ignited will form sulfur dioxide gas
6.6 **Behavior in Fire:** May fuse at very high temperatures
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Gallard Schlesinger Chemical Mfg. Co., 584 Mineola Ave., Carle Place, N.Y. 11514
2. Electronic Space Products Inc., 8945 Robertson Blvd., Los Angeles, Calif. 90034
3. Research Organic Inorganic Chemical Corp., Sun Valley, Calif. 91352

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+% Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 214
13.3 **Boiling Point at 1 atm:** 1049°F = 565°C = 838°K
13.4 **Freezing Point:** 565°F = 307°C = 580°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.5 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

AST

ARSENIC TRICHLORIDE

Common Synonyms
Fuming liquid arsenic
Arsenic (III) trichloride
Arsenic chloride
Arsenous chloride
Caustic arsenic chloride

Liquid | Colorless | Unpleasant odor

Sinks and reacts in water. Poisonous visible vapor cloud is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles and self contained breathing apparatus.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not Flammable.
POISONOUS GASES ARE PRODUCED WHEN HEATED.

Exposure

CALL FOR MEDICAL AID.
VAPOR
POISONOUS IF INHALED.
Move victim to fresh air.
If breathing is difficult, give oxygen.
LIQUID
POISONOUS IF SWALLOWED.
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify health, wildlife and pollution control agencies.
Notify persons using nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant, corrosive.
Restrict access.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Arsenic (III) trichloride, Arsenic chloride, Arsenous chloride, Arsenous chloride, Butter of arsenic, Caustic arsenic chloride, Caustic oil of arsenic, Fuming liquid arsenic
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula** $AsCl_3$
3.4 **IMCO/United Nations Numerical Designation** 6.1, 1560

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless
4.3 **Odor** Acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Safety goggles and face shield; acid type canister gas mask; rubber gloves; protective clothing.
5.2 **Symptoms Following Exposure.** Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe irritation. Ingestion causes weakness and severe irritation of mouth and stomach. Overdose can cause arsenic poisoning, but symptoms are delayed.
5.3 **Treatment for Exposure** Get medical attention after all exposures to this compound. Be alert for arsenic poisoning symptoms. INHALATION: remove to fresh air, give artificial respiration if needed. EYES: flush with water for at least 15 min. SKIN: flush with water. INGESTION: give large amounts of water, then induce vomiting, give lime water, milk, or raw egg, give a cathartic.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.5 mg/m³ as arsenic
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade 3, oral rat LD_{50} = 1.58 mg/kg, fatal human dose 70-180 mg depending on weight
5.7 **Late Toxicity:** Arsenic compounds may be carcinogenic
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics** Data not available
5.10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air** Not flammable
6.3 **Fire Extinguishing Agents.** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Avoid water on adjacent fires
6.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride formed when involved in fire
6.6 **Behavior in Fire** Becomes gaseous and causes irritation. Forms hydrogen chloride (hydrochloric acid) by reaction with water used on adjacent fires.
6.7 **Ignition Temperature.** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with water to generate hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials** Corrodes metal
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Flush with water, rinse with sodium bicarbonate or lime solution
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Cerac, Inc.
1460 W. Silver Spring Rd.
Menomonee Falls, Wis. 53051
2. Ventron Corporation
Alfa Products
P.O. Box 159
Beverly, Mass. 01915
3. Gallard Schlesinger Chemical Manufacturing Co.
584 Mineola Avenue
Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A.O.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisonous, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight:** 181.3
13.3 **Boiling Point at 1 atm**
266.4°F = 130.2°C = 403.4°K
13.4 **Freezing Point**
9°F = −13°C = 260°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity** 2.156 at 25°C (liquid)
13.8 **Liquid Surface Tension**
(est.) 20 dynes/cm = 0.020 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent
13.12 **Latent Heat of Vaporization.**
88.31 Btu/lb = 49.0 cal/g = 2.054 × 10⁵ J/kg
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution** (est.) −18 Btu/lb = −10 cal/g = −0.42 × 10⁵ J/kg
13.16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

ATO	# ARSENIC TRIOXIDE

Common Synonyms

Arsenous acid
Arsenous acid anhydride
Arsenous oxide
Arsenic sesquioxide
White arsenic

Solid crystals or powder — White — Odorless

Sinks and mixes slowly with water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Stay upwind Use water spray to knock down dust
Isolate and restrict discharged material
Notify local health and pollution control agencies

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST

POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air
If in eyes hold eyelids open and flush with plenty of water
If breathing is difficult, give oxygen

SOLID

POISONOUS IF SWALLOWED
Irritating to skin and eyes.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

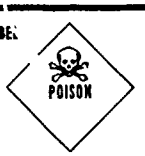
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearest water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Arsenous acid, Arsenous acid anhydride, Arsenous oxide, Arsenic sesquioxide, White arsenic

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula.** As_2O_3

3.4 **IMCO/United Nations Numerical Designation** 6.1/1561

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color:** White

4.3 **Odor:** Like garlic, none

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bureau of Mines approved respirator, protective gloves, eye protection, full protective coveralls

5.2 **Symptoms Following Exposure:** Ingestion causes irritation of mucous membrane, weakness, loss of appetite, gastrointestinal disturbances. Overdose can cause arsenic poisoning, but symptoms are delayed

5.3 **Treatment for Exposure:** Get medical attention after all exposures to this compound. Be alert for arsenic poisoning symptoms. SKIN: wash thoroughly with soap and water; remove contaminated clothing and shower with soap and water. For irritations, except for mild cases which disappear in a day or two, should have medical attention. INGESTION: vomiting should be induced and a physician should be called at once; drink freely of fresh water, sweet milk or raw eggs, followed by castor oil or any brisk cathartic

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ as arsenic

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral mouse LD_{50} = 45 mg/kg

5.7 **Late Toxicity:** Arsenic compounds may be carcinogenic

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air.** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic fumes of arsenic, trioxide and arsine may be formed in fire situations

6.6 **Behavior in Fire:** May volatilize and form toxic fumes of arsenic trioxide

6.7 **Ignition Temperature.** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 5 Amg/l 96 hrs: salmon/harmful *
*Type of water not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. American Smelting and Refining Company
120 Broadway
New York, N.Y. 10005

2. Gallard-Schlesinger Chemical Manufacturing Co.
584 Mineola Avenue
Carle Place, N.Y. 11514

3. Ventron Corp.
Alfa Products
P.O. Box 159
Beverly, Mass. 01915

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Refined 99%
Crude 95%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

HSS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 197.8

13.3 **Boiling Point at 1 atm:** 855°F = 457°C = 730°K

13.4 **Freezing Point:** 599°F = 315°C = 588°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity.** 3.7 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

ART

ARSENIC TRISULFIDE

Common Synonyms			
Arsenic yellow King's gold King's yellow Orpiment Yellow arsenic sulfide	Solid	Yellow orange	Odorless
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
Wear chemical protective suit with self-contained breathing apparatus

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
Harmful to skin
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
SOLID
POISONOUS IF SWALLOWED
Will burn eyes and skin
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting or give anything by mouth.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Arsenic yellow, King's gold, King's yellow, Orpiment, Yellow arsenic sulfide
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** As_2S_3
3 4 **IMCO/United Nations Numerical Designation.** 6.1/1557

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Yellow orange
4 3 **Odor.** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, goggles, rubber gloves, clean protective clothing
5 2 **Symptoms Following Exposure:** (Acute and sub-acute poisoning are not common.) Repeated inhalation causes irritation of nose, laryngitis, mild bronchitis. Ingestion causes weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, occasional hepatitis. Contact with eyes causes irritation. Irritates skin, especially where moist, if not treated, may cause ulceration.
5 3 **Treatment for Exposure:** *Consult physician after all overexposures to this compound.* INHALATION: move to fresh air. INGESTION: induce vomiting by giving warm salt water, repeat until vomit is clear. EYES: flush with water for at least 15 min. SKIN: wash well with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0.5 mg/m³ (as arsenic)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4. LD_{50} < 50 mg/kg
5 7 **Late Toxicity:** Possible skin and lung cancer
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point.** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents.** Water
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Poisonous fumes of the compound may be formed in fires.
6 6 **Behavior in Fire.** May ignite at very high temperatures.
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Mfg. Co.
584 Mineola Ave.
Carle Place, N.Y. 11514
2 Cerac, Inc.
13460 W. Silver Spring Rd.
Menomonee Falls, Wis. 53051
3 Varlacoid Chemical Co.
666 S. Front Street
Elizabeth, N.J. 07202

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical Pure 99+%, Optical grade 99.99+%
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 445-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Poisonous solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** 246
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** 572°F = 300°C = 573°K
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 3.43 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 4 and 5)

NOTES

ASP — ASPHALT

Common Synonyms
Asphaltic bitumen
Bitumen
Petroleum asphalt

Thick liquid (generally heated) Dark Brown to black Tar odor

May float or sink in water Rubbery solid is produced when cooked

Stop discharge if possible
Avoid contact with liquid
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible

Extinguish with water fog, foam, carbon dioxide
Cool exposed containers with water

Exposure

LIQUID
Will burn skin and eyes

Flush affected areas with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
FOULING TO SL. RELINE
May be dangerous if it enters water intakes

Notify local health and pollution control agencies
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Mechanical containment
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Asphalt cements
Asphaltic bitumen
Bitumen
Petroleum asphalt

3 2 **Coast Guard Compatibility Classification:**
Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not pertinent

3 4 **IMCO/United Nations Numerical Design:** IMCO 3 2 1999 UN 3 3/1999

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Dark brown to black

4 3 **Odor:** Tarry

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing, face and eye protection when handling hot material

5 2 **Symptoms Following Exposure:** Contact with skin may cause dermatitis Inhalation of vapors may cause moderate irritation of nose and throat Hot liquid burns skin

5 3 **Treatment for Exposure:** Severe burns may result from contact with hot asphalt If molten asphalt strikes the exposed skin, cool the skin immediately by quenching with cold water Burn should be covered with a sterile dressing and the patient should be taken immediately to a hospital

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD50 5 to 15 g/kg

5 7 **Late Toxicity:** None observed

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure May cause secondary burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 300°F 550°F (C.O.C.)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water spray, dry chemical, foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 400°F 1000°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9. SELECTED MANUFACTURERS

1 Johns Manville Co
Greenwood Plaza
Denver, Colo. 80217

2 Sun Oil Co
1608 Walnut St
Philadelphia, Pa. 19103

3 Witco Chemical Corp
Pioneer Division
277 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Each of the following is available in several grades: asphalt cement; rapid curing liquid asphalt; medium-curing liquid asphalt; slow curing liquid asphalt (road oil); emulsified asphalt; inverted asphaltic emulsion; oxidized (air blown) asphalt

10 2 **Storage Temperature:** Elevated

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A-T-U-X-Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Combustible liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	4
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity** (est.) 1.00 at 20°C (liquid)

13 8 **Liquid Surface Tension**
Data not available

13 9 **Liquid-Water Interfacial Tension:**
70 dynes/cm = 0.07 N/m at 77 °C

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:**
Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

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ARF — ASPHALT BLENDING STOCKS: ROOFERS FLUX

Common Synonyms
Liquid asphalt
Asphaltene
Fluxing oil
Road oil
Petroleum tailings
Dust-laying oil

Oily liquid (generally heated) Dark brown to black Tar odor

May float or sink in water Rubbery solid is produced when cooled

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with water, dry chemical, foam, carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
Harmful if swallowed
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
FOULING TO SHORELINE
May be dangerous if it enters water intakes.
Notify local health and pollution control officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Mechanical containment
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Asphalenum oil
Flux oil
Petroleum tailings
Residual oil
Road oil

3 2 **Coast Guard Compatibility Classification:**
Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not pertinent

3 4 **IMCO-United Nations Numerical Designation** 3 2-1999 3 3 1999

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Brown to black

4 3 **Odor:** Tarry

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing, face and eye protection

5 2 **Symptoms Following Exposure:** Inhalation of vapors from semi-solid materials causes moderate irritation of nasal and upper respiratory tract passages. Aspiration causes slow onset and low degree of chemical pneumonitis with clinical symptoms of lower respiratory tract irritation. Ingestion produces irritation of gastrointestinal tract.

5 3 **Treatment for Exposure:** INHALATION OR ASPIRATION: treatment usually unnecessary. INGESTION: do NOT induce vomiting; do NOT lavage, administer 2-4 oz of olive oil and 1-2 oz of activated charcoal. EYES: wash with plenty of water. SKIN: wipe off material and wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2; LD$_{50}$ 0.5 to 5 g/kg

5 7 **Late Toxicity:** None observed

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause irritation of eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 390-540°F C.C.

6 2 **Flammable Limits in Air:**
Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**
Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 400-700°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):**
Data not available

8 4 **Food Chain Concentration Potential:**
Data not available

9 SELECTED MANUFACTURERS

1 Johns Manville Co
Greenwood Plaza
Denver, Colo. 80217

2 Sun Oil Co
1608 Walnut St
Philadelphia, Pa. 19103

3 Witco Chemical Corp
Pioneer Division
277 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Elevated

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

A T-L

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not Listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	4
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:**
20 to 110°F = −7 to 43°C = 266 to 316°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (est.) 1.11 at 50°C (liquid)

13 8 **Liquid Surface Tension:**
Data not available

13 9 **Liquid-Water Interfacial Tension:**
Data not available

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:**
Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

ASR — ASPHALT BLENDING STOCKS STRAIGHT RUN RESIDUE

Common Synonyms			
Petroleum residue Road binder Seal-coating material Residual asphalt Petroleum asphalt Petroleum pitch	Oily liquid (generally heated)	Black	Tar odor
	May float or sink in water. Rubbery solid is produced when cooled		

Avoid contact with liquid
Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible

Extinguish with water, dry chemical, foam or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Will burn skin and eyes

Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
FOULING TO SHORELINE
May be dangerous if it enters water intakes

Notify local health and pollution control officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Carpeting medium, Petroleum asphalt, Petroleum pitch, Petroleum residue, Residual asphalt, Road binder, Seal coating material

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not pertinent

3 4 **IMCO/United Nations Numerical Designation:** 3 2 1999, 3 3 1999

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Black

4 3 **Odor:** Tarry

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing, eye and face protection

5 2 **Symptoms Following Exposure:** Inhalation may cause moderate irritation of nose and throat. Skin contact may cause dermatitis

5 3 **Treatment for Exposure:** Severe burns may result from contact with hot asphalt. If molten asphalt strikes the exposed skin, cool the skin immediately by quenching with cold water. A burn should be covered with a sterile dressing, and the patient should be taken immediately to a hospital

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ 5 to 15 g/kg

5 7 **Late Toxicity:** None observed

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 400 - 600 F OC

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, foam, carbon dioxide or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 450 - 700 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate.** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** Data not available

9 SELECTED MANUFACTURERS

1 Johns Manville Co
Greenwood Plaza
Denver, Colo 80217

2 Sun Oil Co
1608 Walnut St
Philadelphia, Pa 19103

3 Witco Chemical Corp
Pioneer Division
277 Park Ave
New York, N Y 1001

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature.** Heated

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not Listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	4
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight.** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point.** 50 to 225°F = 76 to 107°C = 299 to 380°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** Data not available

13 8 **Liquid Surface Tension.** Data not available

13 9 **Liquid-Water Interfacial Tension.** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5-ASR

NOTES

REVISED 1978

ATZ	# ATRAZINE

Common Synonyms:
2-Chloro-4-ethylamino-6-isopropylamino-s-triazine
Aatrex Herbicide

Solid crystals — White

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear goggles and self-contained breathing apparatus.
Stay upwind. Use water spray to keep gas/vapor down.
[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
[illegible]
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS have victim drink water
to [illegible]
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS have victim drink water
to [illegible]
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. Water contamination
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2-Chloro-4-ethylamino-6-isopropylamino-S-triazine, Aatrex herbicide
3 2 **Coast Guard Compatibility Classification:** To be developed
3 3 **Chemical Formula.** $C_8H_{14}ClN_5$
3 4 **IMCO/United Nations Numerical Designation.** 6 1 1609

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles, rubber gloves
5 2 **Symptoms Following Exposure.** Irritates eyes and skin. If ingested, irritates mouth and stomach
5 3 **Treatment for Exposure.** EYES: flush with copious amounts of water for 15 min. SKIN: wash with large amounts of water. INGESTION: no specific antidote, induce vomiting and give a saline laxative and supportive therapy
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 3080 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are noninitating to eyes and throat
5 9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air.** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Irritating hydrogen chloride and toxic oxides of nitrogen may be formed
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 12.6 mg/l 48 hr rainbow trout TL_m fresh water
8 2 **Waterfowl Toxicity:** > 2000 mg/kg LD_{50}
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

Ciba-Geigy Corporation
Agricultural Division
P.O. Box 11422
Greensboro, N.C. 27409

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Various grades 70-80% Mixtures with sodium chlorate and sodium metaborate
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not Listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	2
Poisons	0
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** 215.7
13 3 **Boiling Point at 1 atm:** Decomposes
13 4 **Freezing Point:** 347°F = 175°C = 448°K
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est.) 1.2 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** (est.) = 9,900 Btu/lb = 5,500 cal/g = 230 × 10³ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

AZM	# AZINPHOSMETHYL

Common Synonyms
0,0-Dimethyl S-[(4-oxo-1,2,3-benzotriazine-3(4H)-yl) methyl] phosphorodithioate
Guthion insecticide
Gusathion insecticide

Solid — Brown

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear goggles and suits; obtain all health apparatus.
Stop spread of use water spray to knock down dust.
Isolate and remove discharged material.
Notify health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID.

DUST
POISONOUS IF INHALED.
Move victim to fresh air.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing is difficult, give oxygen.

SOLID
POISONOUS IF SWALLOWED.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing. Keep victim quiet and warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** O O Dimethyl S [(4-oxo 1 2,3 benzotriazine-3(4H)-yl)methyl] phosphorodithioate Guthion insecticide Gusathion insecticide

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_{10}H_{12}N_3O_3PS_2$

3 4 **IMCO/United Nations Numerical Designation:** 6 171615

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Brown

4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, protective goggles, rubber gloves

5 2 **Symptoms Following Exposure:** Dust irritates eyes. Inhalation or ingestion causes sweating, constriction of pupils of eyes, asthmatic symptoms, cramps, weakness, convulsions, collapse

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air, keep warm, call doctor. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. INGESTION: get medical attention at once, give water slurry of charcoal, do NOT give milk or alcohol

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, oral rat LD_{50} = 11.15.5 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Oxides of sulfur and phosphorus may be formed when in fire situation

6 6 **Behavior in Fire:** Data not available

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 0.005 mg/l/96 hr/bluegill/TL m/fresh water

8 2 **Waterfowl Toxicity:** 136 mg/kg LD_{50}

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Baychem Corporation
Cherr agro Division
Box 4913
Kansas City, Mo 64120

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, 50% wettable powder, water emulsions

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 317

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** 163°F = 73°C = 346°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.4 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) = 8 600 Btu/lb = −4,800 cal/g = −200 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BRC

BARIUM CARBONATE

Common Synonyms

Solid crystals or powder | White | Odorless

Sinks in water

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
SOLID
If swallowed, will cause nausea and vomiting

IF SWALLOWED and victim is CONSCIOUS [illegible] drink water [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $BaCO_3$
3 4 **IMCO United Nations Numerical Designation:** 6 1 1564

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator
5 2 **Symptoms Following Exposure:** (INGESTION ONLY) excessive salivation, vomiting, severe abdominal pain and violent purging with watery and bloody stools, a slow and often irregular pulse and a transient elevation in arterial blood pressure, tinnitus, giddiness and vertigo, muscle twitchings, progressing to convulsions and/or paralysis, dilated pupils with impaired accommodation, confusion and increasing somnolence, without coma, collapse and death from respiratory failure and cardiac arrest
5 3 **Treatment for Exposure:** Rapid oral administration of a soluble sulfate in water, such as magnesium or sodium sulfate (2 oz), alum (4 gm), or very dilute sulfuric acid (30 ml of a 10% solution diluted to 1 qt). These agents precipitate barium as the insoluble sulfate. Gastric lavage or induced emesis. Seek medical attention.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 to 5 g/kg (rabbit, rat, guinea pig)
5 7 **Late Toxicity:** None observed
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** None
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Chemical Products Corp
Cartersville, Georgia 30120

2 FMC Corp
Inorganic Chemicals Div
633 Third Ave
New York, N Y 10017

3 Sherwin Williams Co
Sherwin Williams Chemicals Div
P O Box 5638
Cleveland, Ohio 44101

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent grade 99 0%
Ceramic grade 95 1%, Ceramic and chemical grade 99 3%, Glass grade 98 8%, Electronic ceramic grade 99 6%
10 2 **Storage Temperature:** Data not available
10 3 **Inert Atmosphere:** Data not available
10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

11

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 197 35
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 4 3 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

BCR

BARIUM CHLORATE

Common Synonyms

Solid White Odorless

Sinks and mixes with water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear goggles. Self-contained breathing apparatus and protective clothing.
Notify [illegible] Federal Agencies.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
May cause fire on contact with combustibles
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Combat fires from safe distance, special [illegible]
Flood discharge area with water.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air.
If no breathing, hold victim's mouth open and give water.
If breathing is difficult, give oxygen.

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, induce vomiting with water or milk and have victim drink plenty of water.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting, and get victim to a doctor immediately.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: oxidizing material
Water contaminant
Should be removed
Chemical and physical treatment
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Barium chlorate monohydrate
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula.** $Ba(ClO_3)_2 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** [illegible] 1445

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid
4.2 **Color:** White
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield; dust respirator (U.S. Bureau of Mines approved); rubberized shoes and gloves; coveralls or other suitable outer clothing.

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of upper respiratory system. Contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea and vomiting, diarrhea, pallor, blueness, shortness of breath, excessive salivation, convulsive tremors, slow, hard pulse, elevated blood pressure, unconsciousness. Hemorrhages may occur in the stomach, intestines and kidneys. Muscular paralysis may follow.

5.3 **Treatment for Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with copious quantities of water for at least 15 min. & get medical attention. SKIN: flush with water. INGESTION: induce vomiting and call physician. Have victim drink aqueous 10% solution of magnesium or sodium sulfate. For severe intoxication, calcium or a magnesium salt may have to be given I.V. with caution. Treatment otherwise is supportive and symptomatic.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible] mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Data not available

5.7 **Late Toxicity:** Barium poisoning

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent.

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable (Bureau of Mines test)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Data not available
6.5 **Special Hazards of Combustion Products:** Yields toxic fumes when involved in fire
6.6 **Behavior in Fire:** May cause an explosion when involved in a fire
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.** Can form explosive mixtures with combustible materials such as oil and wood; these can be ignited by friction.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Barium and Chemicals Inc.
P.O. Box 218
Steubenville, Ohio 43952
2. Ceraq Inc.
13460 W. Silver Spring Road
Menomonee Falls, Wis. 53051
3. Gallard Schlesinger Chemical Manufacturing Co.
584 Mineola Avenue
Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical Reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

SN

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	1
Flammability (Red)	0	0
Reactivity (Yellow)	2	2
	OXY	OXY

*First column refers to fire situation.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight:** 332 (monohydrate)
13.3 **Boiling Point at 1 atm.** Not pertinent
13.4 **Freezing Point:** [illegible] = 414°C (687° K)
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.18 at 20° C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** 36 Btu/lb = 20 cal/g = 0.84 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on next sheet

NOTES

BNT	# BARIUM NITRATE

Common Synonyms

Solid White Odorless

Sinks and mixes with water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY

Fire

Not flammable
May cause fire on contact with combustibles
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - oxidizing material
Avoid water contamination
Should be removed
Chemical and physical treatment
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $Ba(NO_3)_2$
3 4 **IMCO/United Nations Numerical Designation:** UN 1446

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles - face shield dust respirator rubber gloves and shoes suitable coveralls

5 2 **Symptoms Following Exposure:** Inhalation or contact with excessive skin causes irritation Ingestion causes excessive salivation vomiting colic diarrhea convulsive tremors slow hard pulse elevated blood pressure Hemorrhages may occur in the stomach intestines and kidneys Muscular paralysis may follow

5 3 **Treatment for Exposure:** Get medical attention Alert doctor to possibility of barium poisoning particularly if compound was swallowed INHALATION remove to fresh air EYES flush with water for at least 15 min SKIN flush with water INGESTION oral administration of an aqueous 10% solution of magnesium or sodium sulfate to precipitate insoluble barium salts a magnesium salt may have to be given IV with caution Treatment otherwise is supportive and symptomatic

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3 oral rat LD_{50} = 355 mg/kg
5 7 **Late Toxicity:** Barium poisoning
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable (see 7 2)
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Yields toxic gaseous oxides of nitrogen when involved in fire
5 6 **Behavior in Fire:** Mixtures with combustible materials are readily ignited and may burn fiercely Containers may explode
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Contact with combustible material may cause fire
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 500 ppm/ 1 hr/ stickleback/ average survival/ fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 J T Baker Chemical Co
Phillipsburg N J 08865

Barium and Chemicals Inc
P O Box 276
Steubenville Ohio 43952

3 Ventron Corp
Alfa Products
P O Box 299
Beverly Mass 01915

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical Reagent
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0
	OX

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 261.35
13 3 **Boiling Point at 1 atm:** Decomposes
13 4 **Freezing Point:** 592°C = 865°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 3.24 at 23°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** 16 Btu/lb = 20 cal/g = 0.84 × 10⁴ J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

BPC

BARIUM PERCHLORATE

Common Synonyms

Solid | White | Odorless

Sinks and mixes with water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear rubber [illegible] clothing [illegible]
In case of fire, use [illegible]
[illegible]

Fire

Not flammable
May explode on contact with combustibles.
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Containers may explode in fire
Combat fire [illegible]
Dike discharge [illegible]
Cool exposed containers [illegible]

Exposure

CALL FOR MEDICAL AID

DUST

POISONOUS IF INHALED
Irritating to eyes, nose and throat
[illegible]
[illegible]
[illegible]

SOLID

POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]
[illegible]
IF IN EYES: hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS: have victim drink water [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: oxidizing material
water contaminant
Should be removed
Chemical and physical treatment
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Barium perchlorate trihydrate
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $Ba(ClO_4)_2 \cdot 3H_2O$
3.4 **IMCO/United Nations Numerical Designation:** 1.144*

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, dust respirator, rubber gloves and shoes, suitable coveralls
5.2 **Symptoms Following Exposure:** Inhalation or contact with eyes or skin causes irritation. Ingestion causes excessive salivation, vomiting, acute diarrhea, convulsive tremors, slow, hard pulse, and elevated blood pressure; hemorrhages may occur in the stomach, intestines, and kidneys; muscular paralysis may follow.
5.3 **Treatment of Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with water for at least 15 min. SKIN: flush with water. INGESTION: oral administration of an aqueous 10% solution of magnesium or sodium sulfate; for severe intoxication, caution or a magnesium salt may have to be given I.V. with caution; treatment otherwise is supportive and symptomatic.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Barium poisoning
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable (but see 7.2)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Increases the intensity of fire. Containers may explode
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** When mixed with combustible material or finely divided metals, can cause explosions
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Barium and Chemicals Inc
P O Box 218
Steubenville Ohio 43952
2. Cerac Inc
1460 W Silver Spring Rd
Menomonee Falls Wis 53051
3. Gallard Schlesinger Chemical Manufacturing Co
584 Mercola Ave
Carle Place N Y 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, Reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

SN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing materials
12.2 **NAS Haz: 1 Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not Listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 390.35
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** 961°F = 505°C = 778°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.2 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 9.2 Btu lb = Cal/g = 0.2 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

BPM	# BARIUM PERMANGANATE

Common Synonyms

Solid | Dark purple to black | Odorless

Sinks and mixes with water

[illegible]

Fire

Not flammable
May cause fire on contact with combustibles
Containers may explode in fire

[illegible]

Exposure

[illegible]
DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible]
[illegible]
IF SWALLOWED [illegible] CONSCIOUS PERSON [illegible]
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-7)

Issue warning - oxidizing material, water contaminant
Should be removed
Chemical and physical treatment
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $BaMnO_4$
3.4 **IMCO/United Nations Numerical Designation:** 1448

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Dark purple to black
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, dust respirator, rubber gloves and shoes
5.2 **Symptoms Following Exposure:** Inhalation or contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea, vomiting, pulse, shortness of breath
5.3 **Treatment for Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with copious amounts of water for 5 min. SKIN: wash with copious amounts of water. INGESTION: induce vomiting, give a 10% water solution of Epsom salt
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Lethal Toxicity:** Barium poisoning
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Can increase the intensity of fire
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** When mixed with combustible material can ignite by friction or acids may be spont. reacts combustible
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
22 to 4 (mg/l) for Mo. fish to 1 hr fish killed
*Type of water not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Ceroc Inc.
13460 W. Silver Spring Rd.
Menomonee Falls, Wis. 53051

2 Venton Corp.
Alfa Products
P.O. Box 159
Beverly, Mass. 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 174
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 4.27 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heat of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

BPO	# BARIUM PEROXIDE

Common Synonyms
Barium dioxide
Barium superoxide
Barium binoxide

Solid | Light gray to tan | Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear rubber work clothing, including gloves.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
May cause fire on contact with combustibles
Containers may explode in fire
Combat fires from safe distance or protected location
Flood discharge area with water
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air
If in eyes, hold eyelids open and flush with plenty of water
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED
Will burn skin and eyes.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Toxic warning - oxidizing material
Water contaminant
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Barium dioxide
Barium superoxide
Barium binoxide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** BaO_2

3.4 **IMCO/United Nations Numerical Designation:** No. 1449

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Light grayish tan, grayish white

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** NIOSH approved respirator, dust respirator, liquid proof clothing, gloves, chemical safety goggles, full cover clothing

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membranes, throat, and nose. Contact with eyes or skin causes severe burns. Ingestion causes excessive salivation, vomiting, diarrhea, convulsions, tremors, weak, hard pulse, and elevated blood pressure. Severe burns occur in the stomach, intestines, and kidneys. Muscular paralysis may follow.

5.3 **Treatment for Exposure:** Get medical attention. Alert doctor to signs/symptoms of barium poisoning. Antidote if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with water for 5 min. SKIN: flush with water. INGESTION: oral administration of a solution of magnesium or sodium sulfate. In severe intoxication, can give a magnesium salt. May have to be given IV with caution. Treatment otherwise is supportive and symptomatic.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Barium poisoning

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but may cause fire on contact with combustibles

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Flood with water; dry powder (e.g. graphite powder); CO2; sand

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Can increase intensity of fire

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Decomposes slowly. The reaction is not hazardous

7.2 **Reactivity with Common Materials:** Corrodes metal slowly. Ignited with combustible materials or finely divided metals can cause spontaneous ignition

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. FMC Corporation
Industrial Chemicals Division
633 Third Avenue
New York, N.Y. 10017

2. J.T. Baker Chemical Co.
Phillipsburg, N.J. 08865

3. Barium and Chemicals Inc.
P.O. Box 218
Steubenville, Ohio 43952

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 90-92%, high purity reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 169.3

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:**
450°F = 505°K = 232°C

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 4.96 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** -9[illegible] Btu/lb
= [illegible] cal/gm = -4.92 kcal/gm = -20.6 kJ/kg

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4

NOTES

BZD BENZALDEHYDE

Common Synonyms
Oil of bitter almond
Benzoic aldehyde

Watery liquid Colorless to pale yellow Bitter almond odor

May float or sunk in water

Stop discharge if possible. Keep people away.
Avoid contact with liquid.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with water, dry chemical, CO2, or alcohol foam.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and see to it that he induces vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Should be removed

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Benzoic aldehyde
Oil of bitter almond

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:** C_6H_5CHO

3.4 **IMCO/United Nations Numerical Designation** 9/1990

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Like almonds

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles and protective clothing

5.2 **Symptoms Following Exposure** Inhalation of concentrated vapor may irritate eyes, nose and throat. Liquid is irritating to the eyes. Prolonged contact with the skin may cause irritation.

5.3 **Treatment for Exposure:** SKIN EYE CONTACT: move victim to fresh air. Call physician immediately. Wash contaminated skin area with water. Flush eyes with plenty of water for at least 15 min. INGESTION: induce vomiting. Call a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD50 0.5 to 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.042 ppm

6. FIRE HAZARDS

6.1 **Flash Point** 148°F C.C., 169°F O.C.

6.2 **Flammable Limits in Air:**
Data not available

6.3 **Fire Extinguishing Agents** Water spray, foam, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6.5 **Special Hazards of Combustion Products.**
Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** 378°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** 3.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization.**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD).**
50% 10 days
100% 5 days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Fritzsche Dodge and Olcott Inc.
Clifton, N.J. 07015

2 Stauffer Chemical Co.
Specialty Chemicals Division
Edison, N.J. 08817

3 Tenneco Inc.
Tenneco Chemicals Inc.
280 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical grade, 98.0%
NF (ICC) grade, 98.0%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere.** Inerted

10.4 **Venting** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T U-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** 106.12

13.3 **Boiling Point at 1 atm.**
354°F = 179°C = 452°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:**
666°F = 352°C = 625°K

13.6 **Critical Pressure:**
916 psia = 61.5 atm = 6.18 MN/m

13.7 **Specific Gravity.** 1.046 at 20°C (liquid)

13.8 **Liquid Surface Tension.**
40.9 dynes/cm = 0.040 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
15.5 dynes/cm = 0.0155 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.1

13.12 **Latent Heat of Vaporization.**
156 Btu/lb = 86.5 cal/g = 3.62 × 10^5 J/kg

13.13 **Heat of Combustion.** −13,730 Btu/lb
= −7630 cal/g = −319.5 × 10^5 J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

BNZ BENZENE

Common Synonyms
Benzol
Benzole

Watery liquid | Colorless | Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off gas. Shout orders and call fire department.
Keep adding water.
Stay upwind and use water spray to knock down vapor.
Isolate and restrict discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Restrict access.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Benzol, Benzole
3.2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon
3.3 **Chemical Formula:** C_6H_6
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1114

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Aromatic, rather pleasant aromatic odor characteristic odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Hydrocarbon vapor canister, supplied air or a hose mask, hydrocarbon insoluble rubber or plastic gloves, chemical goggles or face splash shield, hydrocarbon insoluble apron such as neoprene.

5.2 **Symptoms Following Exposure:** Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction, coma and possible death.

5.3 **Treatment for Exposure:** SKIN: flush with water, followed by soap and water, remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subside. INHALATION: remove from exposure immediately. Call a physician. If breathing is irregular or stopped, start resuscitation, administer oxygen.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** 25 ppm

5.5 **Short-Term Inhalation Limits:** 75 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 3, LD_{50}: 801 to 5000 mg/kg

5.7 **Late Toxicity:** Leukemia

5.8 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 4.68 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 12°F C.C.
6.2 **Flammable Limits in Air:** 1.4% - 7.9%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 1097°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 6.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 5 ppm/6 hr/minnow: lethal/distilled water; 20 ppm/24 hr/sunfish: TL m/tap water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 1.2 lb/lb/10 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Commonwealth Oil Refining Co., Inc.
Commonwealth Petrochemicals Co.
Penuelas, Puerto Rico 00724
2. Phillips Petroleum Co.
Phillips Puerto Rico Core, Inc.
Banco Popular Center
Hato Rey, P.R. 00936
3. Shell Chemical Co.
Petrochemicals Div.
P.O. Box 2463
Houston, Texas 77001

10. SHIPPING INFORMATION

10.1 **Grades of Purity:**

Industrial	99+%
Thiophene-free	99+%
Nitration	99+%
Industrial 90%	85+%
Reagent	99+%

10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U-A-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 78.11
13.3 **Boiling Point at 1 atm:** 176°F = 80.1°C = 353.3°K
13.4 **Freezing Point:** 42.0°F = 5.5°C = 278.7°K
13.5 **Critical Temperature:** 552.0°F = 288.9°C = 562.1°K
13.6 **Critical Pressure:** 710 psia = 48.3 atm = 4.89 MN/m
13.7 **Specific Gravity:** 0.879 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 28.9 dynes/cm = 0.0289 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 35.0 dynes/cm = 0.035 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 2.7
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.061
13.12 **Latent Heat of Vaporization:** 169 Btu/lb = 94 cal/g = 3.94×10^5 J/kg
13.13 **Heat of Combustion:** −17,465 Btu/lb = −9698 cal/g = -406.0×10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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BHC — BENZENE HEXACHLORIDE

Common Synonyms
1,2,3,4,5,6-Hexachlorocyclohexane
Lindane
BHC
Gammexane
Tri-6

Solid crystals or powder, or solution — Solid is light to dark brown — Musty odor

Solid sinks in water. Solution generally floats on water

Avoid contact with liquid and solid. Keep people away.
Wear goggles and self contained breathing apparatus.
Stop discharge if possible.
Call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Solid not flammable, but usually dissolved in combustible liquid.
POISONOUS GASES ARE PRODUCED WHEN SOLID IS HEATED OR WHEN SOLUTION BURNS
Wear goggles and self contained breathing apparatus.
Extinguish with foam, dry chemical or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

SOLID OR SOLUTION
POISONOUS IF SWALLOWED
Irritating to skin and eyes
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning - water contaminant poison.
Should be removed.
Chemical and physical treatment.

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
BHC
Gammexane
1 2 3 4 5 6 Hexachlorocyclohexane
Lindane

3 2 **Coast Guard Compatibility Classification:**
Not applicable

3 3 **Chemical Formula:** $C_6H_6Cl_6$

3 4 **IMCO United Nations Numerical Designation** 6 1 1618

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Light tan to dark brown

4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Data not available

5 2 **Symptoms Following Exposure:** Hyperirritability and central nervous excitation notable, vomiting, restlessness, muscle spasms, ataxia, and clonic and tonic convulsions. Subsequent central nervous depression leading to respiratory failure. Occasional dermatitis and urticaria.

5 3 **Treatment for Exposure.** Gastric lavage and saline cathartics (not oil laxatives because they promote absorption). Sedatives, pentobarbital or phenobarbital in amounts adequate to control convulsions. Calcium gluconate intravenously may be used in conjunction with sedatives to control convulsions. Rest and quiet. Do NOT use epinephrine because ventricular fibrillation may result.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.5 mg/m³

5 5 **Short-Term Inhalation Limits.** 1 mg/m³ for 30 min

5 6 **Toxicity by Ingestion:** Gamma isomer (Lindane) LD_{50} 88 to 91 mg/kg (rat)
Technical mixture, Grade 2 LD_{50} 0.5 to 5 g/kg

5 7 **Late Toxicity:** Mutagen to human lymphocytes

5 8 **Vapor (Gas) Irritant Characteristics.** Moderately irritating. Personnel will not usually tolerate moderate or high concentrations.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air:**
Not flammable

6 3 **Fire Extinguishing Agents:**
Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Toxic gases are generated when solid is heated or when solution burns.

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.77 ppm 96-hr bluegill TL_m freshwater
0.138 ppm 96-hr guppy TL_m freshwater
0.034 ppm 10-hr coho 2-in 100% lethal salt water

8 2 **Waterfowl Toxicity.** 2000 mg/kg

8 3 **Biological Oxygen Demand (BOD):**
Data not available

8 4 **Food Chain Concentration Potential:**
High

9. SELECTED MANUFACTUPERS

Hooker Chemical Corp
Industrial Chemicals Div
Niagara Falls, N.Y. 14302

10 SHIPPING INFORMATION

10 1 **Grades or Purity:**
Fortified grade 40-45% gamma isomer
Lindane, pure gamma isomer

10 2 **Storage Temperature:**
Data not available

10 3 **Inert Atmosphere.** Data not available

10 4 **Venting.** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Poisonous liquid or solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	2	2
Flammability (Red)	0	1
Reactivity (Yellow)	0	0

*First column refers to non fire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 290.83

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.891 at 19°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

BPD — BENZENE PHOSPHORUS DICHLORIDE

Common Synonyms

Phenylphosphorus dichloride

Liquid | Colorless | Unpleasant odor

Reacts violently with water. Poisonous vapor cloud is produced.

Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.

Fire

Fire data not available

Exposure

CALL FOR MEDICAL AID

GAS PRODUCED IN REACTION WITH WATER
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air
If breathing has stopped, start mouth-to-mouth resuscitation
Keep victim warm and quiet

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing
Flush affected areas with plenty of water
IN EYES, hold eyelids apart and flush continuously with water
IF SWALLOWED, do not induce VOMITING. Give large amounts of water, milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify downstream users of accidental discharge

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Phenyl phosphonous dichloride
Phenylphosphine dichloride
Dichlorophenylphosphine

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula** $C_6H_5PCl_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Acrid, pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus; acid type canister mask; goggles and face shield; rubber gloves; protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat; pulmonary edema may develop following severe exposures. Contact with skin or eyes causes severe burns. Ingestion causes severe burns of mouth and stomach.

5 3 **Treatment for Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove to fresh air; if breathing has stopped, start mouth to mouth resuscitation. EYES: flush with water for at least 15 min.; do not use oils or ointments. SKIN: flush with water; wash with soap and water. INGESTION: give large amounts of milk or water; do NOT induce vomiting; if vomiting does occur, give milk or beaten eggs at one hour intervals.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

Flash Point: 215°F O.C. (May be lower because of presence of dissolved phosphorus)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Large amounts of water

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic fumes include oxides of phosphorus and hydrogen chloride

6 6 **Behavior in Fire:** Containers may rupture; hot liquid is spontaneously flammable because of presence of dissolved phosphorus

6 7 **Ignition Temperature.** 419°F

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** Reacts vigorously to form hydrogen chloride (hydrochloric acid)

7 2 **Reactivity with Common Materials** Corrodes metal except No. 316 stainless steel, nickel or Hastelloy

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Flush with water; rinse with sodium bicarbonate or lime solution

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 PCR Inc.
P O Box 1466
Gainesville, Fla. 32602

2 Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

3 Stauffer Chemical Co.
Agricultural Chemical Division
Westport, Conn. 06880

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** 179.0

13 3 **Boiling Point at 1 atm.** 430°F = 221°C = 494°K

13 4 **Freezing Point** +60°F = +51°C = 222°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 1.140 at 25°C (liquid)

13 8 **Liquid Surface Tension.** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** (est.) −8 200 Btu/lb = −4 500 cal/g = −190 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** −72 Btu/lb = −40 cal/g = −1.7 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 6 and 6)

NOTES

BPT — BENZENE PHOSPHORUS THIODICHLORIDE

Common Synonyms

Benzenethiophosphonyl chloride
Phenylphosphonothioic dichloride
Phenylphosphine thiodichloride

Liquid | Colorless | Unpleasant odor

Sinks and reacts in water. Poisonous visible vapor cloud is produced.

[illegible]

Fire

Fire data not available

Exposure

CALL FOR MEDICAL AID

VAPOR PRODUCED IN REACTION WITH WATER

POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move to fresh air
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing
Flush affected areas with plenty of water
IN EYES hold eyelids apart and flush with water for at least 15 minutes
IF SWALLOWED do not induce vomiting. Give large quantities of water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Benzenethiophosphonyl chloride; Phenylphosphonothioic dichloride; Phenylphosphine thiodichloride
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula.** $C_6H_5PSCl_2$
3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless to light yellow
4 3 **Odor:** Acrid pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Self-contained breathing apparatus; acid type canister mask; goggles and face shield; rubber gloves; protective clothing
5 2 **Symptoms Following Exposure:** Inhalation of vapor irritates nose and throat; pulmonary edema may result. Contact with eyes or skin causes severe irritation. Ingestion causes severe irritation of mouth and stomach
5 3 **Treatment for Exposure** Get medical attention following all exposures to this compound. INHALATION remove to fresh air. EYES flush with water for at least 15 min; do not use oils or ointments. SKIN flush with water; wash with soap and water. INGESTION give large quantities of water or milk; induce vomiting; give milk, eggs or olive oil
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** 252°F O C
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic fumes include oxides of phosphorus and sulfur and hydrogen chloride
6 6 **Behavior in Fire.** Containers may rupture
6 7 **Ignition Temperature:** [illegible]
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Forms hydrogen chloride fumes (hydrochloric acid). The reaction is slow unless water is hot
7 2 **Reactivity with Common Materials:** Corrodes metal slowly
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Flush with water; rinse with sodium bicarbonate or lime solution
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 West St. Paul Ave
Milwaukee, Wis. 53233

2 PCR Inc
P. O. Box 1466
Gainesville, Fla. 32602

3 Stauffer Chemical Co
Agricultural Chemical Division
Westport, Conn. 06880

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight:** 211
13 3 **Boiling Point at 1 atm**
[illegible]°F = 270°C = 543 K
13 4 **Freezing Point.**
−11.2 F = −24.0 C = 249.2 K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.378 at 20°C (liquid)
13 8 **Liquid Surface Tension**
(est.) 25 dynes/cm = 0.025 N/m at 20 C
13 9 **Liquid-Water Interfacial Tension:**
Not pertinent
13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion** (est.) −7,700 Btu/lb
= −4,300 cal/g = −180 × 10 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** (est.) −9 Btu/lb
= −5 cal/g = −0.2 × 10 J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

BZA	# BENZOIC ACID

Common Synonyms Benzenecarboxylic acid Carboxybenzene	Solid crystals or powder White Faint pleasant odor Sinks in water
Avoid [illegible] with skin and eyes Wear eyeglasses and [illegible] protective apparatus Stay upwind and keep out of [illegible] [illegible] In case of emergency [illegible] Notify [illegible]	
Fire	Combustible Vapor may explode if ignited in an enclosed area Dust may form explosive mixture with air Extinguish with water [illegible]
Exposure	CALL FOR MEDICAL AID **DUST** Irritating to nose and throat if inhaled Move to fresh air **SOLID** Irritating to skin and eyes Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify [illegible] health and wildlife officials Notify operators of nearest water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Benzenecarboxylic acid
Carboxybenzene
Diacyclic acid

3 2 **Coast Guard Compatibility Classification**
Not applicable

3 3 **Chemical Formula:** C_6H_5COOH

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** White

4 3 **Odor:** Faint pleasant slight aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bureau of Mines dust respirator when melted material present use eye protection and organic respirator for fumes

5 2 **Symptoms Following Exposure:** Dust may be irritating to nose and eyes At elevated temperatures fumes may cause irritation of eyes respiratory system and skin

5 3 **Treatment for Exposure** Remove patient to fresh air EYE CONTACT flush eyes with water

5 4 **Toxicity by Inhalation, (Threshold Limit Value).** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 0 5 to 5 g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin Dust may irritate nose and eyes

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point** 250°F C C

6 2 **Flammable Limits in Air:** Not pertinent

6 5 **Fire Extinguishing Agents** Dry powder chemical foam water fog carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** None

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Vapor from molten benzoic acid may form explosive mixture with air Concentrated dust may form explosive mixture

6 7 **Ignition Temperature:** 1065 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
200 ppm/7 hr goldfish/lethal fresh water
500 ppm/1 hr sunfish/lethal fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
1650 mg/g/5 days

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St Louis Mo 63166

2 Northwest Industries Inc
Velsicol Chemical Corp
341 E Ohio St
Chicago Ill 60611

3 Tenneco Chemicals Inc
Tenneco Intermediates Div
8 Turner Place
Piscataway N J 08854

10 SHIPPING INFORMATION

10 1 **Grades of Purity:**
USP FCC grade 99 5% 100 5%

10 2 **Storage Temperature:**
Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

H

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 122 12

13 3 **Boiling Point at 1 atm:**
480 0°F = 249 2°C = 522 4°K

13 4 **Freezing Point:** 252 1°F = 122 3°C = 395 5°K

13 5 **Critical Temperature:**
894°F = 479°C = 752°K

13 6 **Critical Pressure:**
660 psia = 45 atm = 4 6 MN/m

13 7 **Specific Gravity:** 1 316 at 28°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6

NOTES

BZN — BENZONITRILE

Common Synonyms
Phenylcyanide
Cyanobenzene
Benzoic acid nitrile

Liquid | Colorless | Almond-like odor

May float or sank in water

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes nose and throat
If inhaled will cause headache, difficult breathing or loss of consciousness.
[illegible]
LIQUID
Irritating to skin and eyes
If swallowed will cause headache nausea, vomiting or loss of consciousness.
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminants
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Benzoic acid nitrile
Cyanobenzene Phenylcyanide

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** C_7H_5N

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Almond like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves splash proof goggles, rubber boots or rubber overshoes, impervious clothing for splash protection cartridge type mask or other protection against vapor must be worn for working in poorly ventilated areas where poisoning by inhalation may be possible

5 2 **Symptoms Following Exposure:** Benzonitrile may enter the human body by ingestion absorption through the skin, or inhalation The earliest symptoms of cyanide compound intoxication may be weakness headaches confusion and occasionally nausea and vomiting The respiratory rate and depth will usually be increased at the beginning and at later stages become slow and gasping Blood pressure is usually normal especially in the mild or moderately severe cases although the pulse rate is usually more rapid than normal

5 3 **Treatment for Exposure:** INHALATION remove patient to fresh air, get immediate medical attention INGESTION *Call physician immediately* Until physician arrives take the following steps a Provide for inhalation of amyl nitrite vapor from ampules crushed in a handkerchief and held to the nose of the victim b Induce vomiting unless patient is unconscious (Gastric lavage should be employed by or under the supervision of a physician c Keep patient warm and quiet until medical attention arrives EYES immediately flush with large volumes of water for at least 15 min SKIN wash thoroughly at once, without scrubbing with large amounts of soap and water OTHER exposed personnel should be checked periodically for chronic toxic effects

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral rat LD_{50} = 800 mg/kg

(Continued on page 4)

6 FIRE HAZARDS

(Material is combustible but burns with difficulty)

6 1 **Flash Point:** 161°F CC

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Toxic hydrogen cyanide and oxides of nitrogen may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature.** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Difficult to burn

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** Will attack some plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
5 ppm 24 hr rainbow trout/no effect fresh water
135 ppm 96 hr fathead minnow TL_m soft fresh water
28 ppm 96 hr fathead minnow TL_m hard fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** 0.05 (theo.) 18 days

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Velsicol Chemical Corp.
341 E Ohio Street
Chicago Ill 60611

2 Eastman Organic Chemicals
Rochester N Y 14650

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** Ventilated (natural)

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

ATX

12 HAZARD CLASSIFICATIONS

12 1 ***Code of Federal Regulations.*** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 103.12

13 3 **Boiling Point at 1 atm.** 376°F = 191°C = 464°K

13 4 **Freezing Point:** 9.0°F = −12.8°C = 260.4°K

13 5 **Critical Temperature:** 709.2°F = 426.2°C = 699.4°K

13 6 **Critical Pressure** 611 psia = 41.6 atm = 4.22 MN/m

13 7 **Specific Gravity:** 1.01 at 25°C (liquid)

13 8 **Liquid Surface Tension.** 34.7 dynes/cm = 0.0347 N/m at 25°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** 3.6

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.091

13 12 **Latent Heat of Vaporization:** 155.7 Btu/lb = 87.6 cal/g = 3.67 × 10³ J/kg

13 13 **Heat of Combustion:** −15,100 Btu/lb = −8,400 cal/g = −351 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

5 HEALTH HAZARDS (Cont'd)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

BZP BENZOPHENONE

Common Synonyms
Benzoyl benzene
Diphenyl ketone
Diphenyl methanone
Alpha-oxodiphenylmethane
Alpha-oxotoluene

Liquid or solid | White | Flowers odor

May float or sink in water

[illegible]

Fire

Combustible
[illegible]

Exposure

[illegible]
LIQUID OR SOLID
Irritating to skin and eyes.
If swallowed will cause nausea, or vomiting
[illegible]
IN EYES [illegible]
IN CASE OF [illegible] CONSULTATION [illegible] water
[illegible]
IN CASE OF [illegible] CONSULTATION OR HAVING CONVULSIONS
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Benzoylbenzene
Diphenylketone Diphenylmethanone
alpha Oxodiphenylmethane
alpha Oxotoluene

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula:** $C_6H_5COC_6H_5$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid or solid

4 2 **Color:** White

4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes gastrointestinal disturbances. Contact causes eye irritation and if perforated irritation of skin

5 3 **Treatment for Exposure:** INHALATION remove to fresh air. INGESTION get medical attention. EYES flush with water for at least 15 min., get medical attention if irritation persists. SKIN flush with water, wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 acute oral rat LD_{50} = 10 000 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

(Material is combustible)

6 1 **Flash Point:** Data not available

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Will attack some plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Eastman Organic Chemical
Rochester, N Y 14650

2 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee, Wis 53233

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99+

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A I No II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 182

13 3 **Boiling Point at 1 atm:** 581.9°F = 305.5°C = 578.7°K

13 4 **Freezing Point:** 119.2°F = 47.9°C = 321.1°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.095 at 50°C (liquid)

13 8 **Liquid Surface Tension:** 42 dynes/cm = 0.042 N/m at 50°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** [illegible] Btu/lb = 700 cal/g = 2.93 x 10^3 J/kg

13 13 **Heat of Combustion** = -17 400 Btu/lb = -9 650 cal/g = -38.8 x 10^3 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

BZC BENZOYL CHLORIDE

Common Synonyms	
Benzenecarbonyl chloride	Watery liquid Colorless to slightly brown Sinks and reacts slowly with water producing a poisonous gas.

Avoid contact with liquid and vapor
Wear goggles and self-contained breathing apparatus
Keep people away Evacuate area in case large discharge
Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED
Wear oxygen-self contained breathing apparatus
DO NOT USE WATER
Extinguish with foam dry chemical carbon dioxide

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS have victim drink water or milk
*DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate spill or leak
Prevent dust cloud
Clean up and prevent entrainment

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Benzenecarbonyl chloride
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula.** C_7H_5OCl
3 4 **IMCO United Nations Numerical Designation:** None

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless may become slightly brownish on standing
4 3 **Odor:** Pungent characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Full protective clothing including full face respirator for acid gases and organic vapors (yellow GME canister) chemical fitting goggles nonslip rubber gloves plastic apron face shield

5 2 **Symptoms Following Exposure:** INHALATION may irritate eyes nose and throat INGESTION causes acute discomfort SKIN causes irritation and burning

5 3 **Treatment for Exposure:** INHALATION remove to fresh air administer oxygen if breathing is difficult or stopped give artificial respiration if not breathing EYES flush with water for 15 minutes get medical attention SKIN wash with plenty of soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5 9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second- and third-degree burns on skin contact and is very irritating to the eyes

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 162°F (72°C)
6 2 **Flammable Limits in Air:** 2 - 4.9
6 3 **Fire Extinguishing Agents.** Foam carbon dioxide dry chemical water fog
6 4 **Fire Extinguishing Agents Not to be Used:** Water spray Do not allow water to enter containers
6 5 **Special Hazards of Combustion Products:** Highly poisonous phosgene gas may be formed in fire
6 6 **Behavior in Fire:** Water at temperatures below 200°F (93°C) reacts slowly with water or steam
6 7 **Ignition Temperature:** 1292°F (700°C)
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Slow reaction with water to produce hydrochloric acid fumes Reaction much faster with steam
7 2 **Reactivity with Common Materials.** Slowly corrosive to metals but no corrosive hazard
7 3 **Stability During Transport:** Not pertinent
7 4 **Neutralizing Agents for Acids and Caustics:** Soda ash and water Lime
7 5 **Polymerization:** Does not occur
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 300 ppm 72-hr goldfish lethal fresh water 300 ppm 72-hr sunfish lethal fresh water
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** 10% 5 days
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Northwest Industries Inc
Velsicol Chemical Corp
341 E Ohio St
Chicago Illinois 60611

2 Occidental Petroleum Corp
Hooker Chemical Corp
Industrial Chemicals Division
Niagara Falls N Y 14302

3 Stauffer Chemical Co
Specialty Chemicals Division
Green Farms Rd
Westport Conn 06880

10 SHIPPING INFORMATION

10 1 **Grades or Purity** 99% technical grade
10 2 **Storage Temperature** Store in cool dry area
10 3 **Inert Atmosphere:** Data not available
10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XXSO

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive material

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	2
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	1
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 140.57
13 3 **Boiling Point at 1 atm:** 390°F = 199°C = 472°K
13 4 **Freezing Point:** 30°F = -0.6°C = 272°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.211 at 25°C (liquid)
13 8 **Liquid Surface Tension:** 36 dynes/cm = 0.036 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Data not available
13 13 **Heat of Combustion:** -11,030 Btu/lb = -6526 cal/g = -273.2 × 10³ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

REVISED 1978

BAL

BENZYL ALCOHOL

Common Synonyms
Phenylcarbinol
Benzenecarbinol
Alpha-hydroxytoluene
Phenylmethanol
Phenylmethyl alcohol

Liquid | Colorless | Mild, pleasant odor

May float or sink in water

AVOID CONTACT — LIQUID AND VAPOR KEEP PEOPLE AWAY
[illegible]

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, coughing, or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting.
MAY BE READILY ABSORBED THROUGH THE SKIN
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Benzenecarbinol, *alpha* Hydroxytoluene, Phenylcarbinol, Phenylmethanol, Phenylmethyl alcohol
3 2 **Coast Guard Compatibility Classification:** Not Listed
3 3 **Chemical Formula.** $C_6H_5CH_2OH$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color.** Colorless
4 3 **Odor** Mild, pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, chemical safety goggles
5 2 **Symptoms Following Exposure:** Inhalation of vapor may cause irritation of upper respiratory tract. Prolonged or excessive inhalation may result in headache, nausea, vomiting, and diarrhea. In severe cases, respiratory stimulation followed by respiratory and muscular paralysis, convulsions, narcosis and death may result. Ingestion may produce severe irritation of the gastrointestinal tract, followed by nausea, vomiting, cramps and diarrhea. Tissue ulceration may result. Contact with eyes causes local irritation. Material can be absorbed through skin with anesthetic or irritant effect.
5 3 **Treatment for Exposure:** INHALATION: remove victim from contaminated atmosphere, call physician immediately. INGESTION: induce vomiting and contact a physician. EYES: flush with plenty of water for 15 min. and contact a physician. SKIN: flush with water, wash with soap and water, obtain medical attention in case of irritation or central nervous system depression.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 1 230 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** 5.5 ppm

6. FIRE HAZARDS

6 1 **Flash Point:** 220°F (O.C.) 213°F (C.C.)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Alcohol foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** 817°F
6 8 **Electrical Hazards:** [illegible]
6 9 **Burning Rate:** 1.74 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Will attack some plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibition of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 360 ppm/48 hr daphnia magna TL$_m$ * * water type not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** 1.5% 5 days
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Velsicol Chemical Corp
341 E. Ohio St.
Chicago, Ill. 60611

2 Stauffer Chemical Company
Specialty Chemical Div.
Meadow Road
Edison, N.J. 088[illegible]

3 Givaudan Corporation
125 Delawanna Avenue
Clifton, N.J. 07014

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** NF, Photographic, Technical, Textile
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A,P,T,X

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 108.13
13 3 **Boiling Point at 1 atm:** 401°F = 205°C = 478°K
13 4 **Freezing Point:** 4.5°F = −15.3°C = 257.9°K
13 5 **Critical Temperature:** 757°F = 403°C = 676°K
13 6 **Critical Pressure:** 663 psia = 45.0 atm = 4.57 MN/m²
13 7 **Specific Gravity:** 1.050 at 15.15°C (liquid)
13 8 **Liquid Surface Tension:** 39.0 dynes/cm = 0.0390 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 3.73
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.070
13 12 **Latent Heat of Vaporization:** 197 Btu/lb = 107 cal/g = 4.48 × 10⁵ J/kg
13 13 **Heat of Combustion:** −14 550 Btu/lb = −8 260 cal/g = −345 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

BZM BENZYLAMINE

Common Synonyms
Alpha-aminotoluene
Phenylmethylamine

Liquid Colorless to light yellow Strong ammonia odor

Floats and mixes with water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause dizziness, headache, or difficult breathing

LIQUID
Will burn skin and eyes
Harmful if Swallowed

Water Poilution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - air contaminant, water contaminant
Restrict access
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** *alpha* Aminotoluene
Phenylmethylamine
3 2 **Coast Guard Compatibility Classification:** Not Listed
3 3 **Chemical Formula:** $C_6H_5CH_2NH_2$
3 4 **IMCO/United Nations Numerical Designation:** Not Listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless to light yellow
4 3 **Odor:** Strong ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation of vapor causes irritation of the mucous membranes of the nose and throat and respiration with respiratory distress and cough. Headache, nausea, faintness and anxiety can occur. Exposure to vapor produces eye irritation with lachrymation, conjunctivitis and corneal edema resulting in halos around lights. Direct local contact with liquid is known to produce severe and sometimes permanent eye damage and skin burns. Vapors may also produce primary skin irritation and dermatitis
5 3 **Treatment for Exposure:** INHALATION: remove victim from exposure, if breathing is difficult administer oxygen, if breathing has stopped begin artificial respiration. EYES or SKIN: wash with copious amounts of water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 168°F C.C.
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides may form in a fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 4.1 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** In presence of moisture may weakly corrode some metals. Liquid will attack some plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 60 ppm/48 hr/Daphnia/Fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Miles Laboratories Inc
Sumner Division
Elkhart Ind 46514
2. The Ames Laboratories Inc
200 Rock Lane
Milford Conn 06460
3. Eastman Organic Chemicals
Rochester N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial, 99.5+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Ventilated (natural)
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P-Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 107.16
13 3 **Boiling Point at 1 atm:** 364.1°F = 184.5°C = 457.7°K
13 4 **Freezing Point:** (approx.) -51°F = -46°C = 227°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.98 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 39.5 dynes/cm = 0.0395 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 3.70
13 11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.070
13 12 **Latent Heat of Vaporization:** (est.) 164 Btu/lb = 91 cal/g = 3.8 × 10⁵ J/kg
13 13 **Heat of Combustion:** -16,260 Btu/lb = -9,040 cal/g = -378 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** -43 Btu/lb = -24 cal/g = -1.0 × 10⁵ J/kg
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

BBR	# BENZYL BROMIDE

Common Synonyms alpha-Bromotoluene omega-Bromotoluene Bromotoluene alpha	Liquid Colorless to yellow Sharp irritating odor Sinks in water
[illegible]	
Fire	Combustible Irritating gases are produced when heated [illegible]
Exposure	LIQUID Irritating to skin and eyes. Harmful if swallowed [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: extreme
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** alpha Bromotoluene
omega Bromotoluene
Bromotoluene alpha

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_6H_5CH_2Br$

3 4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to yellow

4 3 **Odor:** Very sharp pungent lachrymator

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, goggles, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, severe exposure may cause pulmonary edema. Vapors cause severe eye irritation, liquid can burn eyes. Skin: Causes irritation. Ingestion causes irritation of mouth and stomach

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: irrigate immediately with plenty of water for 15 min. SKIN: flush with water, wash with soap and water. INGESTION: do NOT induce vomiting, give large amounts of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** [illegible]

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen bromide gas may be produced

6 6 **Behavior in Fire:** Expected that vapors will form explosive mixtures with air

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly to generate hydrogen bromide and bromous acids

7 2 **Reactivity with Common Materials:** Decomposes rapidly in the presence of all common metals except mercury and lead, liberating heat and hydrogen bromide

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Rinse with sodium bicarbonate or lime solution

7 5 **Polymerization:** Polymerizes with evolution of heat and hydrogen bromide when in contact with all common metals except mercury and lead

7 6 **Inhibitor of Polymerization:** None used

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
0.05 mg/l * marine fish, no irritant response, salt water
1.5 mg/l * marine fish, violent irritant activity, salt water
* Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 White Chemical Corporation
East 22nd Street
P O Box 275
Bayonne, N J 07002

2 Eastman Kodak Co
Eastman Organic Chemicals
Rochester, N Y 14650

3 Aldrich Chemical Co
940 West St Paul Avenue
Milwaukee, Wis 53233

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

XQXY

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive

*12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 171.0

13 3 **Boiling Point at 1 atm:**
388°F = 198°C = 471°K

13 4 **Freezing Point:** 25.0°F = -3.9°C = 269.1°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.441 at 22°C (liquid)

13 8 **Liquid Surface Tension:**
32.3 dynes/cm = 0.0323 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:**
[illegible] dynes/cm = 0.035 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 5.9

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Data not available

13 12 **Latent Heat of Vaporization:** [illegible]
= [illegible] cal/g = 2.75 x 10^5 J/kg

13 13 **Heat of Combustion:** [illegible]
= -9 000 cal/g = -2.10 x 10^7 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(See next page)

NOTES

BBP — BENZYL n-BUTYL PHTHALATE

Common Synonyms			
Butyl benzyl phthalate Phthalic acid, benzyl butyl ester	Liquid	Colorless	Slight odor
	Sinks in water		

Fire	Combustible Irritating gases may be produced when heated
Exposure	LIQUID Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

2. LABELS

3 CHEMICAL DESIGNATIONS

- 3 1 **Synonyms:** Butyl benzyl phthalate; Phthalic acid, benzyl butyl ester
- 3 2 **Coast Guard Compatibility Classification:** Ester
- 3 3 **Chemical Formula:** $C_{19}H_{20}O_4$
- 3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

- 4 1 **Physical State (as shipped):** Liquid
- 4 2 **Color:** Colorless
- 4 3 **Odor:** Slight aromatic

5 HEALTH HAZARDS

- 5 1 **Personal Protective Equipment:** Protective clothing and goggles
- 5 2 **Symptoms Following Exposure:** Prolonged contact with liquid causes irritation to skin and eyes
- 5 3 **Treatment for Exposure:** FLUSH with water for at least MIN; wash skin with soap and water
- 5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
- 5 5 **Short-Term Inhalation Limit:** Data not available
- 5 6 **Toxicity by Ingestion:** Grade 1 Minimal LD50 = 2.0 g/kg
- 5 7 **Late Toxicity:** Data not available
- 5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to eyes and throat
- 5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard present; irritates eyes
- 5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

- 6 1 **Flash Point:** Not listed
- 6 2 **Flammable Limits in Air:** Data not available
- 6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, foam
- 6 4 **Fire Extinguishing Agents Not to be Used:** Water stream may cause frothing
- 6 5 **Special Hazards of Combustion Products:** Irritating vapors of unburned chemical may be evolved
- 6 6 **Behavior in Fire:**
- 6 7 **Ignition Temperature:** Data not available
- 6 8 **Electrical Hazard:** Data not available
- 6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

- 7 1 **Reactivity with Water:** No reaction
- 7 2 **Reactivity with Common Materials:**
- 7 3 **Stability During Transport:** Stable
- 7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7 5 **Polymerization:** Not pertinent
- 7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8 1 **Aquatic Toxicity:** Data not available
- 8 2 **Waterfowl Toxicity:** Data not available
- 8 3 **Biological Oxygen Demand (BOD):** Data not available
- 8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Monsanto Co
800 N Lindbergh Blvd
St Louis, Mo 63166

2 Petro-Tex Chemical Corp
8600 Northern Blvd
Deer Park, N Y 11729

10 SHIPPING INFORMATION

- 10 1 **Grades of Purity:** Commercial
- 10 2 **Storage Temperature:** Ambient
- 10 3 **Inert Atmosphere:** No requirement
- 10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

X X

12. HAZARD CLASSIFICATIONS

- 12 1 **Code of Federal Regulations:** Not listed
- 12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

- 12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13 1 **Physical State at 15°C and 1 atm:** Liquid
- 13 2 **Molecular Weight:** 312
- 13 3 **Boiling Point at 1 atm:** 370°F = 360°C = 633 K
- 13 4 **Freezing Point:** Not pertinent
- 13 5 **Critical Temperature:** Not pertinent
- 13 6 **Critical Pressure:** Not pertinent
- 13 7 **Specific Gravity:** 1.12 at 20°C (liquid)
- 13 8 **Liquid Surface Tension:** Data not available
- 13 9 **Liquid-Water Interfacial Tension:** Data not available
- 13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 13 12 **Latent Heat of Vaporization:** Data not available
- 13 13 **Heat of Combustion:** -14,550 Btu/lb = -8,090 cal/g = -338 X 10³ J/kg
- 13 14 **Heat of Decomposition:** Not pertinent
- 13 15 **Heat of Solution:** Not pertinent
- 13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

BCL	# BENZYL CHLORIDE

Common Synonyms

alpha-Chlorotoluene
omega-Chlorotoluene

Watery liquid Colorless to yellow Sharp irritating odor

Sinks in water

Fire

Combustible
Irritating gases are produced when heated

Exposure

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Toxic warning: corrosive
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** alpha-Chlorotoluene
omega-Chlorotoluene
Chlorotoluene, alpha

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** C_7H_7Cl

3.4 **IMCO/United Nations Numerical Designation:** 1738

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Pungent, irritating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles or face shield; self-contained breathing apparatus; positive pressure hose mask; full mask industrial canister type gas mask or chemical cartridge respirator; rubber gloves; protective clothing

5.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory tract with coughing, burning of the throat, headache, dizziness and weakness; lung damage and pulmonary edema may occur after severe exposure; chronic irritation of the upper respiratory tract may occur after prolonged and repeated exposure to vapors. Immediate and severe eye irritation may result from contact with the liquid or vapors; prolonged or permanent eye damage may result. Vapors irritate skin and liquid may cause severe burns. Ingestion may cause immediate and severe burns of the mouth, throat and gastrointestinal tract; nausea, vomiting, cramps and diarrhea may follow; gastrointestinal damage and systemic effects may result.

5.3 **Treatment for Exposure:** INHALATION: remove from contaminated atmosphere. If breathing has ceased, start mouth-to-mouth resuscitation; oxygen, if available, should be administered only by an experienced person when authorized by a physician. Keep patient warm and comfortable; call a physician immediately. EYES: immediately flush with large quantities of running water for a minimum of 15 min., lids held open apart during irrigation to ensure flushing of the entire surface of the eye and lids with water; do not attempt to neutralize with chemical agents; obtain medical attention as soon as possible; only instruments should not be used unless directed by a physician; continue irrigation for an additional 15 min. if physician is not available. SKIN: immediately flush affected areas with water; remove contaminated clothing under shower; continue washing with water; do not attempt to neutralize with chemical agents; obtain medical attention if irritation persists. INGESTION: give large amounts of water; do NOT induce vomiting.

Cont. on page 4

6 FIRE HAZARDS

6.1 **Flash Point:** 153°F (67°C) (CC)

6.2 **Flammable Limits in Air:** 1.1% - 14.4%

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam and carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride gas may be generated

6.6 **Behavior in Fire:** Forms vapor that is a powerful irritant gas

6.7 **Ignition Temperature:** 1085°F (585°C)

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Under prolonged exposure to heat, reacts slowly, liberating hydrogen chloride gas (chloric acid)

7.2 **Reactivity with Common Materials:** Decomposes rapidly in the presence of common metals with the exception of nickel and lead; heat accelerates the reaction and hydrogen chloride

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Reacts with dilute hydroxide solutions

7.5 **Polymerization:** Polymerizes with evolution of heat and hydrogen chloride when in contact with all common metals except nickel and lead

7.6 **Inhibitor of Polymerization:** Triethylamine, propylene oxide or sodium carbonate

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.05 mg/l* mat. of fish in oxygen reducing salt water
0.1 mg/l* marine fish toxic to organisms activity salt water
*Time period not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Stauffer Chemical Company
Specialty Chemical Division
Westport, Connecticut

Velsicol Chemical Corporation
341 East Ohio Street
Chicago, Illinois

Monsanto Company
Monsanto Industrial Chemicals
800 North Lindbergh Boulevard
St. Louis, Missouri

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 98.5% + water, inhibitors maintained

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See manual "Assessment Handbook" CG 446-3)

NOXY

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	*
Aesthetic Effect	*
Reactivity	
Other Chemicals	*
Water	2
Self Reactive	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 126.6

13.3 **Boiling Point at 1 atm:**
354.9°F = 179.4°C = 452.5°K

13.4 **Freezing Point:**
-16.5°F = -26.9°C = 246.3°K

13.5 **Critical Temperature:**
685.2°F = 418°C = 691°K

13.6 **Critical Pressure:**
685.2°F = 41.4 atm = 608 MN/m²

13.7 **Specific Gravity:** 1.10 at 25°C (liquid)

13.8 **Liquid Surface Tension:**
37.5 dynes/cm = 0.0375 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
(est.) 35 dynes/cm = 0.035 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4.36

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0689

13.12 **Latent Heat of Vaporization:** 150 Btu/lb = 70 cal/g = 2.9 × 10⁵ J/kg

13.13 **Heat of Combustion:** -12,000 Btu/lb = -6,700 cal/g = -280 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

5 HEALTH HAZARDS (Cont'd.)

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; oral rat LD_{50} = 1.231 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.

5.10 **Odor Threshold:** 0.04 ppm

BCF

BENZYL CHLOROFORMATE

Common Synonyms
Carbobenzoxy chloride
Chloroformic acid, benzyl ester
Benzylcarboxyl chloride
Benzyl chlorocarbonate

Liquid | Colorless | Sharp, irritating odor

Sinks in water. Reacts with water.

Call fire department.
Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control officials.

Fire

Combustible.
POISONOUS GASES ARE PRODUCED IN FIRE.
Containers may explode in fire.
Wear chemical protective clothing with self-contained breathing apparatus.
Extinguish with dry chemical, carbon dioxide, or foam.

Exposure

Call for medical aid.

LIQUID

Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing.
Flush eyes and skin with plenty of water.
IF INHALED, if victim is not breathing, give artificial respiration.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (two glasses).

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive.
Restrict access.
Should be removed.
Chemical and physical treatment.

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Carbobenzoxy chloride
Chloroformic acid, benzyl ester
Benzylcarbonyl chloride
Benzyl chlorocarbonate

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $C_8H_7O_2Cl$

3 4 **IMCO/United Nations Numerical Designation** 8 1739

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Irritating, sharp, penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus; acid type canister mask; goggles or face shield; rubber gloves; protective clothing.

5 2 **Symptoms Following Exposure:** Inhalation causes mucous membrane irritation. Eyes are irritated by excessive exposure to vapor. Liquid causes severe irritation of eyes and irritates skin. Ingestion causes irritation of mouth and stomach.

5 3 **Treatment for Exposure.** INHALATION: remove from exposure, support respiration, call physician. EYES: irrigate with copious amounts of water for 15 min. SKIN: flush with large quantities of water, wash with soap and water. INGESTION: give large amounts of water; do NOT induce vomiting.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade 3. LD$_{50}$ 50 to 500 mg/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 176°F O.C., 227°F C.C.
Vigorous decomposition occurs at these temperatures; thus these values are anomalous due to the effect of the decomp products (benzyl chloride and CO_2).

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents:** Dry chemical, foam and carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Data not available

6 5 **Special Hazards of Combustion Products.** Toxic phosgene, hydrogen chloride, and benzyl chloride vapors may form.

6 6 **Behavior in Fire:** Containers may explode.

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate.** 4.0 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Forms hydrogen chloride (hydrochloric acid). The reaction is not very vigorous in cold water.

7 2 **Reactivity with Common Materials** Slow corrosion of metal

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Flush with water, rinse with sodium bicarbonate or lime solution.

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Chemetron Corporation
Organic Chemicals Division
393 Seventh Avenue
New York, N.Y. 10001

2 Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

3 PCR, Inc.
P.O. Box 1466
Gainesville, Fla. 32602

10 SHIPPING INFORMATION

10 1 **Grades or Purity** 97+%

10 2 **Storage Temperature** Ambient, in cool place

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A O X-Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	3
Self Reaction	3

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 170.6

13 3 **Boiling Point at 1 atm** (decomposes)
306°F = 152°C = 425°K

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.22 at 20°C (liquid)

13 8 **Liquid Surface Tension.**
(est.) 25 dynes/cm = 0.025 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** (est.) 90 Btu/lb = 50 cal/g = 2.1 × 10^5 J/kg

13 13 **Heat of Combustion.** (est.) −10 000 Btu/lb = −5 700 cal/g = −240 × 10^5 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

BZO — BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE

Common Synonyms			
Stearyldimethylbenzyl-ammonium chloride Tallow benzyl dimethyl ammonium chloride Benzyldimethylstearyl-ammonium chloride	Solid or thick liquid Sinks and mixes with wate	White	Mild odor

Stop discharge if possible. Keep people away.
Avoid contact with liquid and solid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with water.

Exposure

CALL FOR MEDICAL AID
LIQUID OR SOLID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing. Keep victim warm.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of canals, waterways and reservoirs.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 **Synonyms:** Benzyldimethylstearylammonium chloride, Dimethylbenzyloctadecylammonium chloride Dimethyloctadecylbenzyl-ammonium chloride, Octadecyl dimethylbenzylammonium chloride

3 2 **Coast Guard Compatibility Classification:** Not listed

(Continued on page 4)

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid or viscous liquid

4 2 **Color:** White

4 3 **Odor.** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes gastrointestinal disturbances Contact with chemical irritates eyes and skin and may damage eyes

5 3 **Treatment for Exposure:** INGESTION do NOT induce vomiting give large quantities of fluid and call physician immediately EYES flush with plents of water for at least 15 min call a physician SKIN remove contaminated clothing flush skin with plenty of water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral rat LD_{50} = 4 000 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen and hydrochloric acid fumes may form in fires

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 5 ppm/48 hr/australoborus snails/80% kill/fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Finc Organics Inc
205 Main Street
Lodi N J 07644

2 Lonza Inc
Fair Lawn N J 07410

3 Ashland Chemical Company
P O Box 2219
Columbus Ohio 43216

10. SHIPPING INFORMATION

10 1 **Grades or Purity.** Pure 95+%
24 26% solution in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 411

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes at 120°C)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** > 1 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

3 CHEMICAL DESIGNATIONS (Cont'd)

3 3 **Chemical Formula:** $(C_6H_5CH_2)(CH_3)_2N^+C_{18}H_{37}Cl^-$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

BMA — BENZYLTRIMETHYLAMMONIUM CHLORIDE

Common Synonyms
BTMAC
Trimethylbenzylammonium chloride

Liquid | Light yellow | Mild almond odor

May float or sink in water

Stop discharge if possible. Keep people away.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals, foam, carbon dioxide.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold lids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water.
Induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting. Keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** BTMAC
Trimethylbenzylammonium chloride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula**
$C_6H_5CH_2N(CH_3)_3Cl$ or $C_{10}H_{16}ClN$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Light yellow

4 3 **Odor:** Mild almond

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles and rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes gastrointestinal disturbances. Contact with liquid irritates eyes and may irritate skin.

5 3 **Treatment for Exposure:** INGESTION: give large amount of water, get medical attention.
EYES: flush with water for at least 15 min., if irritation continues, get medical attention.
SKIN: flush well with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 3; LD_{50} 50-500 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents**
Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products**
Toxic oxides of nitrogen and hydrochloric acid fumes may form in fire.

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

3 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Tanatex Chemical Company
Page and Schuyler Avenues
Lyndhurst, N J 07071

2 Stu Chemical Co
P O Box 70
Chester, S C 29706

3 Ashland Chemical Company
P O Box 2219
Columbus, Ohio 43216

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** 50, 60% solution in water

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Liquid

13 2 **Molecular Weight:** 172 (solute)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.07 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
Data not available

13 9 **Liquid-Water Interfacial Tension.**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BIC

BERYLLIUM CHLORIDE

Common Synonyms	Solid	White to green	Sharp odor
	Sinks and mixes violently with water		

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear dust respirator and rubber protective clothing including gloves
Stop discharge if safe
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Irritating gases may be produced when heated

Wear goggles and self-contained breathing apparatus
DO NOT USE WATER ON ADJACENT FIRES

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing, difficult breathing, or loss of consciousness.

If on skin Remove victim to fresh air and flush with plenty of water
If breathing has stopped Give artificial respiration
If breathing is difficult Give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes
If swallowed will cause nausea coughing, or loss of consciousness.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES Hold victim's eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS Induce vomiting
Have victim sip water
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS
Do not induce vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

Notify local health and pollution control agencies

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, corrosive
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $BeCl_2$
3 4 **IMCO/United Nations Numerical Designation.** 6 1/1566

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White to green
4 3 **Odor:** Sharp acrid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirators, protection gloves, freshly laundered clothing, chemical safety goggles

5 2 **Symptoms Following Exposure:** Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Ingestion causes irritation of mouth and stomach. Contact with dust causes conjunctival inflammation of eyes and irritation of skin. Any dramatic, unexplained weight loss should be considered as a possible first indication of beryllium disease.

5 3 **Treatment for Exposure.** INHALATION: chest x-ray should be taken immediately for evidence of pneumonitis. EYES: flush with water for at least 15 min; if irritation persists, get medical attention. SKIN: cuts or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleansed immediately by a physician.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.002 mg/m³ (as beryllium)

5 5 **Short-Term Inhalation Limits:** 0.025 mg/m³ for less than 30 min

5 6 **Toxicity by Ingestion.** Grade 3 oral rat LD_{50} = 86 mg/kg

5 7 **Late Toxicity:** Be produces a chronic systemic disease that primarily affects the lung but also can involve other organs such as lymph nodes, liver, bones, and kidneys.

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires
6 5 **Special Hazards of Combustion Products:** Toxic and irritating beryllium oxide fumes and hydrogen chloride may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously with evolution of heat. Forms beryllium oxide and hydrochloric acid solution
7 2 **Reactivity with Common Materials:** Corrodes most metals in presence of moisture. Flammable and explosive hydrogen gas may collect in enclosed spaces.
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.15 ppm*/96 hr/fathead minnow/TL$_m$/soft fresh water
15 ppm*/96 hr, fathead minnow TL$_m$/hard fresh water
*as beryllium

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
None

(Continued on page 4)

9. SELECTED MANUFACTURERS

1 Kawecki Berylco Industries Inc
Hazleton, Pa 18201

2 Varlacoid Chemical Co
666 South Front St
Elizabeth, N J 07202

3 Research Organic/Inorganic Chemical Corp
11686 Sheldon
Sun Valley, Calif 91352

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

RR

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 79.9
13 3 **Boiling Point at 1 atm:** (sublimes) 958°F = 520°C = 793°K
13 4 **Freezing Point:** 824°F = 440°C = 713°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.90 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** −1 000 Btu/lb = −557 cal/g = −2.33 × 10⁶ J/kg
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6

8 WATER POLLUTION (Cont'd.)

8 4 **Food Chain Concentration Potential:** Bioconcentration of 100 fold can occur under constant exposure. Not significant in spill conditions.

BEF

BERYLLIUM FLUORIDE

Common Synonyms

Solid White Odorless

Sinks and mixes with water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST

POISONOUS IF INHALED IF SWALLOWED OR IF SKIN IS EXPOSED

Will burn eyes

SOLID

POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Will burn eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS

May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant

Restrict access

Should be removed

Chemical and physical treatment

2 LABEL

POISON

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula.** BeF

3 4 **IMCO/United Nations Numerical Designation:** 6 1,1566

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color** White

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirators protection gloves goggles

5 2 **Symptoms Following Exposure:** Any dramatic weight loss should be considered as possible first indication of beryllium disease Inhalation causes irritation of nose throat and lungs severe pneumonitis and or pulmonary edema Ingestion causes fatigue weakness loss of appetite Contact with eyes causes severe irritation and burns Contact with skin causes dermatitis and non healing ulcers

5 3 **Treatment for Exposure:** INHALATION move to fresh air chest x ray should be taken immediately to detect pneumonitis if exposure has been severe INGESTION induce vomiting get medical attention EYES flush with water for at least 15 min get medical attention SKIN flush with water get medical attention if skin has been broken

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 002 mg m³ (as beryllium)

5 5 **Short-Term Inhalation Limits:** 0 025 mg m³ less than 30 min

5 6 **Toxicity by Ingestion.** Grade 3 oral LD_{50} = 100 mg kg (mouse)

5 7 **Late Toxicity:** Berylliosis of lungs may occur from 3 months to 15 years after exposure Chronic systemic diseases of the liver spleen lymph nodes bone kidneys and other organs may also occur

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic and irritating vapor of unburned material may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.**

0 15 ppm*/96 hr fathead minnow TL_m fresh (soft) water

1 5 ppm*/96 hr fathead minnow TL_m fresh (hard) water

*As beryllium

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential** Bioconcentration of 100 fold under constant exposure only Not significant under spill conditions

9. SELECTED MANUFACTURERS

1 Kawecki Berylco Industries Inc
P O Box 429
Hazleton, Pa 18201

2 Brush Wellman Inc
South River Road
Elmore Ohio 43416

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10 SHIPPING I FORMATION

10 1 **Grades or Purity:** Purified 99 9%
Chemically pure 99 4%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 47

13 3 **Boiling Point at 1 atm** Not pertinent (sublimes at 800°C)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 99 at 20 C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 180 Btu/lb = 98 cal/g = 4 1 × 10⁵ J/kg

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6

NOTES

BEM	# BERYLLIUM METALLIC

Common Synonyms	Solid	Silver color	Odorless
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear dust respirator and rubber protective clothing including gloves.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Dust cloud may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry graphite sodium chloride or other dry powder.
DO NOT USE WATER ON FIRE.

Exposure

CALL FOR MEDICAL AID.
DUST.
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.
If inhaled will cause coughing or difficult breathing.
If on skin, pull eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
SOLID.
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate material. Prevent water contamination.
Restrict access.
Should be removed.
Chemical and physical treatment.

2 LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** No common synonyms.
3.2 **Coast Guard Compatibility Classification** Not listed.
3.3 **Chemical Formula:** Be
3.4 **IMCO/United Nations Numerical Designation:** 4.1 1567

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu Mines approved respirator, clean work clothes, cloth gloves, eye protection.
5.2 **Symptoms Following Exposure:** Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Dust is extremely toxic when inhaled; symptoms include coughing, shortness of breath, and acute or chronic lung disease. There is no record of illness from ingestion of beryllium. Contact with dust causes conjunctival inflammation, eczema and dermatitis.
5.3 **Treatment for Exposure.** INHALATION: acute disease may require hospitalization with administration of oxygen; chest x-ray should be taken immediately. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water; all cuts, scratches or other injuries should receive prompt medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.002 mg/m
5.5 **Short-Term Inhalation Limits:** 0.025 mg/m for 30 min
5.6 **Toxicity by Ingestion.** Grade 3 LD$_{50}$ 50-500 mg/kg
5.7 **Late Toxicity:** Beryllium disease may occur in lung, lymph nodes, liver, spleen, kidneys, and other organs.
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Graphite, sand, or any other inert dry powder
6.4 **Fire Extinguishing Agents Not to be Used:** Water
6.5 **Special Hazards of Combustion Products.** Combustion yields beryllium oxide fume which is toxic if inhaled.
6.6 **Behavior in Fire:** Powder may form explosive mixture with air.
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available.
8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1. Vulcan Chemical Co.
   666 South Front St.
   Elizabeth, N.J. 07202
2. Gallard Schlesinger Chemical Mfg. Co.
   584 Mineola Avenue
   Carle Place, N.Y. 11514
3. Platz and Bauer, Inc.
   126-04 Northern Blvd.
   Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Grade AA 99.9%+
Grade A 99.8%+ Nuclear grade
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	4
Flammability (Red)	1
Reactivity (Yellow)	1

* Applies to dust or powder

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 9.01
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.85 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion** −28,000 Btu/lb = −15,560 cal/g = −652 × 10^3 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on page 4 and 5

NOTES

BEN — BERYLLIUM NITRATE

Common Synonyms			
Beryllium nitrate trihydrate	Solid	White	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear respirator and rubber coveralls during cleanup.
Stop discharge if possible.
Isolate and limit access to area.
Notify local health and pollution control agencies.

Fire

Not flammable.
Will increase the intensity of a fire.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish fire with water.

Exposure

CALL FOR MEDICAL AID.

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing.
If breathed, move victim to fresh air. Give artificial respiration.
If breathing is difficult, give oxygen.
If on skin, wash with plenty of water.

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
If swallowed will cause nausea, vomiting or loss of consciousness.
Remove victim to fresh air.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, induce vomiting; drink water or milk and have victim inhale amyl nitrite.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing; get victim to a doctor.
Keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning. Poison. Water contaminant.
Restrict access.
Should be removed.
Chemical and physical treatment.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Beryllium nitrate trihydrate

3.2 **Coast Guard Compatibility Classification:**
Not listed

3.3 **Chemical Formula:** $Be(NO_3)_2 \cdot 3H_2O$

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1566

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirators, protective gloves, freshly laundered clothing, chemical safety goggles.

5.2 **Symptoms Following Exposure:** Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Ingestion causes anorexia, fatigue, weakness, malaise. Contact with eyes causes conjunctival inflammation. Contact with skin causes dermatitis and non-healing ulcers.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, take chest x-ray immediately to check for pneumonitis. INGESTION: induce vomiting, get medical attention. EYES: flush with water for at least 15 min, get medical attention. SKIN: cut or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleansed immediately by a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.002 mg/m³ as beryllium

5.5 **Short-Term Inhalation Limits:** 0.025 mg/m³ for less than 30 min

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** May cause chronic, systemic disease of the lung as well as other organs such as liver, spleen, lymph nodes, bone and kidneys.

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not combustible

6.2 **Flammable Limits in Air:** Not combustible

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating beryllium oxide and oxides of nitrogen may form in fire.

6.6 **Behavior in Fire:** May increase intensity of fire when in contact with combustible material.

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to form weak solution of nitric acid; the reaction is not hazardous.

7.2 **Reactivity with Common Materials:** In presence of moisture will damage wood and corrode most metals.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.15 ppm/96 hr fathead minnow, TLm, salt water
20 ppm/96 hr fathead minnow, TLm, hard water
*as beryllium

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:**
Bioconcentration of 100 fold can occur under constant exposure. Not significant in spill conditions.

9 SELECTED MANUFACTURERS

1. Kawecki Berylco Industries, Inc.
Hazleton, Pa. 18201

2. Nuclear Chemical Co.
666 South Front St.
Elizabeth, N.J. 07202

3. Gallard Schlesinger Chemical Mfg. Co.
584 Mineola Avenue
Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Purified

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Poisonous solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
Solid

13.2 **Molecular Weight:** 205.1

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.56 at 20°C (solid)

13.8 **Liquid Surface Tension:**
Not pertinent

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization**
Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(continued on page 1-BEN)

NOTES

BEO — BERYLLIUM OXIDE

Common Synonyms	Solid	White	Odorless
Beryllia Bromellite	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear Dust respirator and rubber [illegible]
Stop discharge if possible
Isolate and remove discharged material
Notify [illegible] health and pollution [illegible] agencies

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
If inhaled will cause coughing and difficult breathing
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]
IN EYES [illegible] with water
IF SWALLOWED [illegible] INDUCE VOMITING [illegible] water [illegible]
SWALLOWED [illegible] CONSCIOUS OR HAVING CONVULSIONS
[illegible] warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Beryllia, Bromellite
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula.** BeO
3 4 **IMCO/United Nations Numerical Designation:** 6 1 1566

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirator, protective gloves, freshly laundered clothing, chemical safety goggles

5 2 **Symptoms Following Exposure:** Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Other symptoms include anorexia, fatigue, weakness, malaise. Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Contact with dust causes conjunctival inflammation of eyes and irritation of skin.

5 3 **Treatment for Exposure:** INHALATION: take chest x-ray immediately; check for pneumonitis. INGESTION: induce vomiting, get medical attention. EYES: flush with water for [illegible] min, get medical attention. SKIN: cover puncture wounds in which beryllium may be embedded; wounded skin should be thoroughly cleansed immediately by physician.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.002 mg/m³ as beryllium

5 5 **Short-Term Inhalation Limits:** 0.025 mg/m³ for less than 30 min

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Beryllium disease may occur in lymph nodes, liver, spleen, kidneys, eyes, as well as lung

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic beryllium oxide fume may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential.** Bioconcentration of 100-fold can occur under constant exposure. Not significant in pH conditions

9. SELECTED MANUFACTURERS

1 Varlacoid Chemical Co
666 South Front St
Elizabeth, N J 07202

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place, N Y 11514

3 Ventron Corporation
P O Box 159
Beverly, Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, Nuclear
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 25
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 3.0 at 20°C (solids)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

BES

BERYLLIUM SULFATE

Common Synonyms
Beryllium sulfate tetrahydrate

Solid | White | Odorless

Sinks and mixes with water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing.
[illegible]

SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IF INHALED [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

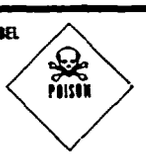
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison water
contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Beryllium sulfate tetrahydrate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $BeSO_4 \cdot 4H_2O$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirators protective clothes, fresh laundered clothing, chemical safety goggles

5.2 **Symptoms Following Exposure:** Any dramatic unexplained weight loss should be considered as possible first indication of beryllium disease. Other symptoms include anorexia, fatigue, weakness, malaise. Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, anoxia, cough. Contact with eyes causes conjunctival inflammation. Contact with skin causes dermatitis. Open wounds, irritant or sensitization type, cause ulcer formation when in contact with salts.

5.3 **Treatment or Exposure:** INHALATION: take chest x-ray immediately to check for evidence of pneumonitis. INGESTION: induce vomiting, get medical attention. EYES: flush with water for at least 15 min., get medical attention. SKIN: cuts or puncture wounds in which beryllium may be embedded, under no circumstances should be thoroughly cleansed immediately by a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.002 mg/m³ as beryllium

5.5 **Short-Term Inhalation Limits:** 0.025 mg/m³ less than 30 min.

5.6 **Toxicity by Ingestion:** Grade 3, oral rat LD_{50} = 82 mg/kg

5.7 **Late Toxicity:** Beryllium disease may occur in the lymph nodes, liver, spleen, kidneys, etc., as well as lung.

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic beryllium oxide and sulfuric acid fumes may form in fire
6.6 **Behavior in Fire**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
11 ppm 96-hr fathead minnow TL_m hard fresh water
0.2 ppm 96-hr fat cad minnow TL_m soft fresh wat
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Bioconcentration of 100-fold can occur under constant exposure. Not significant in spill conditions

9 SELECTED MANUFACTURERS

1. Brush Wellman Inc
Elmore, Ohio 43416
2. Kawecki Berylco Industries Inc
Hazleton, Pa. 18201
3. Van Waters & Rogers Co
606 South Front St
Elizabeth, N.J. 07202

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** High purity
Analytical grade
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XX

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 15°C (solids)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** [illegible]
[illegible] cal/g = [illegible] x 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

BOC

BISMUTH OXYCHLORIDE

Common Synonyms
Bismuth chloride oxide
Basic bismuth chloride
Bismuthyl chloride
Bismuth subchloride

Solid | White | Odorless

Sinks in water

Stop discharge if possible. Keep people away.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
Irritating gases may be produced when heated
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
Harmful if inhaled
If in eyes: Hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing. Wash clothes.
Flush affected areas with plenty of water.
IF IN EYES: Hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim CONSCIOUS: Have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 448-4)

Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard labels required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Basic bismuth chloride, Bismuth chloride oxide, Bismuth subchloride, Bismuthyl chloride, Pearl white
3.2 **Coast Guard Comparability Classification:** Not listed
3.3 **Chemical Formula:** BiOCl
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, protective gloves, dust mask
5.2 **Symptoms Following Exposure:** Contact with dust causes irritation of eyes, nose and throat and can cause skin rashes
5.3 **Treatment for Exposure:** EYES: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 0 LD$_{50}$ > 2 g/kg, rats
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride gas may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. The Mearl Corp.
41 East 42nd St.
New York, N.Y. 10017
2. Mallinckrodt Chemical Works
223 Wevside Ave.
P.O. Box 384
Jersey City, N.J. 07303
3. Whittaker Corporation
Runa Pearl Company Division
East 21st Street
Bayonne, N.J. 07002

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Dry powder, 98%; aqueous concentrates, slurries or solid in mineral oil or castor oil
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 260.4
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 7.7 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.15 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

BPA — BISPHENOL A

Common Synonyms	Physical Description	Color	Odor
4,4'-Isopropylidenediphenol; p,p'-Dihydroxydiphenylmethylmethane; 2,2-Bis(4-hydroxyphenyl)propane	Solid flakes or powder Sinks in water	White to light brown	Weak medicine odor

Avoid contact with solid and dust. Keep people away.
Use fire department.
Isolate and remove discarded material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemical, foam, carbon dioxide
Cool containers with water

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to nose and throat if inhaled
Move victim to fresh air

SOLID
Irritating to skin and eyes
Harmful if swallowed
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water
or milk and induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give anything by mouth

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and pollution control agencies
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Should be removed

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
2,2-Bis(4-hydroxyphenyl)propane
p,p'-Dihydroxydiphenyldimethylmethane
4,4'-Isopropylidenediphenol
Diphenylolpropane; HP
3.2 **Coast Guard Compatibility Classification.**
Not applicable
3.3 **Chemical Formula:**
$HOC_6H_4C(CH_3)_2C_6H_4OH$
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White to tan
4.3 **Odor:** Very faint phenolic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved dust and vapor type respirator; impervious boots, gloves and body covering clothing; safety glasses with side shields; protective cream for repeated exposure; dust tight goggles if irritation. Safety glasses with side shields
5.2 **Symptoms Following Exposure:** Dust irritating to upper respiratory passages; may cause coughing
5.3 **Treatment for Exposure:** SKIN: Wash with soap and plenty of water. Remove contaminated clothing. EYES: Promptly flush with plenty of water. Get medical attention if irritation persists. INGESTION: Induce vomiting if victim is conscious. Give large quantities of water. Never give anything by mouth to victim who is unconscious or having convulsions. Get medical attention promptly.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not specified
5.5 **Short-Term Inhalation Limits:** Not specified
5.6 **Toxicity by Ingestion:** Grade 2 LD50 (Oral, Rat): 3.25 g/kg
5.7 **Late Toxicity:** Lowered hemoglobin and erythrocyte (red blood cell) counts below normal in rats
5.8 **Vapor (Gas) Irritant Characteristics.** Not specified
5.9 **Liquid or Solid Irritant Characteristics.** Moderate hazard. Dust irritating to eyes and all mucous membranes. Prolonged or repeated skin contact may cause dermatitis.
5.10 **Odor Threshold.** Not specified

6 FIRE HAZARDS

6.1 **Flash Point:** 418°F (OC)
6.2 **Flammable Limits in Air:**
Not pertinent
6.3 **Fire Extinguishing Agents:**
Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:**
Data not available
6.5 **Special Hazards of Combustion Products:**
Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.**
No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):**
Data not available
8.4 **Food Chain Concentration Potential.**
Data not available

9 SELECTED MANUFACTURERS

1. Dow Chemical Co
Midland, Michigan 48640
2. General Electric Co
(Plastics Div)
Pittsfield, Mass. 01201
3. Shell Chemical Co
Polymers Div
P.O. Box 2463
Houston, Texas 77001

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial, high purity
10.2 **Storage Temperature:** Data not available
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight:** 228.29
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** 313°F (156°C) (Crystals)
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.195 (25°C/4°C)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 2)

NOTES

REVISED 1978

BDE — BISPHENOL A DIGLYCIDYL ETHER

Common Synonyms
4,4' Isopropylidenediphenol-epichlorohydrin resin
Bisphenol A - epichlorohydrin condensate
2,2-Bis(p-hydroxyphenyl) propane, diglycidyl ether

Liquid — Yellowish brown

Sinks in water

Stay clear of potential
Call fire department
Avoid contact with liquid
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with water, dry chemicals, carbon dioxide

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Wear self-contained breathing apparatus
Wear suitable protective clothing
IF IN EYES: Hold eyelids apart and flush with plenty of water
IF SWALLOWED: Induce vomiting. Give large quantities of water or milk
IF SWALLOWED: Do NOT induce vomiting. Give large quantities of water
Do not induce vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 4,4'-Isopropylidenediphenol-epichlorohydrin resin, Bisphenol A epichlorohydrin condensate, 2,2 Bis (p-hydroxy benzyl) propane diglycidyl ether

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{21}H_{24}O_4$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Amber

4.3 **Odor:** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles, protective clothing and protective creams. Good personal hygiene is necessary, with instruction of personnel and adequate cleanup facilities

5.2 **Symptoms Following Exposure:** Contact with liquid irritates eyes. Prolonged or repeated contact with skin causes irritation and dermatitis

5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: remove chemical with water or waterless skin cleaner

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 LD_{50} > 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin

5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** 175°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Shell Chemical Co
1 Shell Plaza
Houston, Texas 77002

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X X

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 340

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.16 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion:** (est.) −14,900 Btu/lb = −8,300 cal/g = −350 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Data not available

Continued on page 5 and 6

NOTES

BCP — BOILER COMPOUND, LIQUID

Common Synonyms

Liquid Colorless to brown Odorless or mild odor

Sinks and mixes with water

Fire

Not flammable
Flammable gas may be produced on contact with metals.

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-6)

Issue warning: corrosive water contaminant
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Alkanes liquid alkaline detergent
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to brown
4.3 **Odor:** Mild to mild

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves; protective clothing
5.2 **Symptoms Following Exposure:** Contact of liquid with eyes causes severe caustic burns. Also causes caustic burns of skin if not washed off immediately. Ingestion causes caustic burns of mouth and stomach.
5.3 **Treatment for Exposure:** Basic treatment is identical with that for caustic soda or caustic potash solutions. EYES: flush with water for at least 15 min.; call a doctor. SKIN: flush with water; wash with soap and water. INGESTION: give large amounts of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Not pertinent
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Gas burns on contact
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Attacks aluminum and zinc; reaction may form flammable hydrogen gas
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. BASF Wyandotte Corp
Chemical Specialties Division
Wyandotte, Mich. 48192
2. Nalco Chemical Co
180 N. Michigan Ave
Chicago, Ill. 60601
3. Ohio Water Services
3155 Fiberglas Road
Kansas City, Kan. 66115

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Various commercial grades, some of which contain chelating and complexing agents for metals
10.2 **Storage Temperature:** Ambient; preferably 40-100 F
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classification:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** >220°F = >104°C = >377°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.15 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 of 4

NOTES

BAC	# BORIC ACID

Common Synonyms
Orthoboric acid
Boracic acid

Solid — White — Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Boracic acid, Orthoboric acid
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** H_3BO_3
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles

5.2 **Symptoms Following Exposure:** Although no adverse effects have been reported from exposure, boric acid can be absorbed through mucous membranes. Ingestion of grams or more may irritate gastrointestinal tract and affect central nervous system. Contact with dust or aqueous solutions may irritate eyes and skin. Adverse effects have been recognized but continued contact should be avoided. Dust and solutions are absorbed through burns and open wounds but not through unbroken skin.

5.3 **Treatment for Exposure:** INHALATION: remove from contaminated atmosphere. INGESTION: obtain medical attention as soon as possible. If the patient is conscious, induce vomiting by giving warm salty water (2 tablespoons of table salt to a pint of water) or warm soapy water. If this measure is unsuccessful, vomiting may be induced by tickling the back of the patient's throat with a finger. Vomiting should be encouraged about three times or until the vomitus is clear. Additional water may be given to wash out the stomach. EYES: immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids open during the irrigation to ensure flushing of the entire surface of the eye and lids with water. Obtain medical attention as soon as possible. SKIN: immediately flush affected area with water. Remove contaminated clothing under the shower. Continue washing with water. Do not attempt to neutralize with chemical agents. Obtain medical attention if irritation persists. Wash clothing

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³ (as H_3BO_3) (ACGIH)

5.5 **Short-Term Inhalation Limits:** Data not available

(Continued on page 2)

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** [illegible]
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 1400 ppm 24 hr TL_m fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Kerr-McGee Chemical Corp
Kerr-McGee Bldg
Oklahoma City, Okla 73102

U.S. Borax and Chemical Co
3075 Wilshire Blvd
Los Angeles, Calif 90010

Stauffer Chemical Co
Industrial Chemicals Div
Westport, Conn 06880

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 99.9% NF 99.9%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

NN-II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **MAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 61.83
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.5 at 4°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -4.37 Btu/lb (-2.43 kcal/g) (-10.17 kJ/g)
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 3)

5 HEALTH HAZARDS (Cont'd)

5.6 **Toxicity by Ingestion:** Grade 2 Moderately Toxic, Poisoning
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Odorless

6TB	# BORON TRIBROMIDE

Common Synonyms	Liquid	Colorless	Sharp odor
	Reacts violently with water Poisonous vapor is produced		

Will react with liquid metals. Keep away from wet metals.
Not flammable in steel.
Incompatible with carbonates, metals.
Not flammable, but will pollute water supplies.

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear self-contained breathing apparatus
DO NOT USE WATER ON AREA NEAR FIRE

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
Remove Do this while calling for medical aid
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, give several glasses of water
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS
do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify authorities if enters water courses
Notify authorities if enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive, air contaminant
Restrict access
Disperse and flush with care

2 LABEL



3. CHEMICAL DESIGNATIONS

- 3 1 **Synonyms:** No common synonyms
- 3 2 **Coast Guard Compatibility Classification:** Not listed
- 3 3 **Chemical Formula:** BBr_3
- 3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

- 4 1 **Physical State (as shipped):** Liquid
- 4 2 **Color:** Colorless
- 4 3 **Odor** Sharp irritating

5 HEALTH HAZARDS

- 5 1 **Personal Protective Equipment:** Chemical safety glasses or face mask, rubber gloves and respirators protection
- 5 2 **Symptoms Following Exposure.** Inhalation causes severe irritation of mucous membranes Ingestion causes burns of mouth and stomach Contact with eyes or skin causes severe burns
- 5 3 **Treatment for Exposure** *Get medical attention for all exposures to this chemical* INHALATION remove from exposure, support respiration INGESTION give large amounts of water EYES flush with water for at least 15 min SKIN wash thoroughly with water launder clothing before reuse
- 5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 ppm
- 5 5 **Short-Term Inhalation Limits:** Data not available
- 5 6 **Toxicity by Ingestion:** Data not available
- 5 7 **Late Toxicity:** Data not available
- 5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
- 5 9 **Liquid or Solid Irritant Characteristics.** Data not available
- 5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

- 6 1 **Flash Point:** Not flammable
- 6 2 **Flammable Limits in Air:** Not flammable
- 6 3 **Fire Extinguishing Agents** Not pertinent
- 6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water or foam on adjacent fires
- 6 5 **Special Hazards of Combustion Products:** Toxic fumes of the chemical or hydrogen bromide may form in fires
- 6 6 **Behavior in Fire:**
- 6 7 **Ignition Temperature:** Not pertinent
- 6 8 **Electrical Hazard** Not pertinent
- 6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

- 7 1 **Reactivity with Water:** Reacts violently to form hydrobromic acid solution and fumes
- 7 2 **Reactivity with Common Materials:** Strongly attacks metals and wood Flammable hydrogen gas may collect in enclosed spaces
- 7 3 **Stability during Transport:** Stable
- 7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash
- 7 5 **Polymerization:** Not pertinent
- 7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

- 8 1 **Aquatic Toxicity:** Data not available
- 8 2 **Waterfowl Toxicity:** Data not available
- 8 3 **Biological Oxygen Demand (BOD).** None
- 8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Eagle-Picher Industries Inc
Miami Research Laboratories
Miami, Okla 74354

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

3 Ventron Corporation
P O Box 159
Beverly, Mass 01915

10 SHIPPING INFORMATION

- 10 1 **Grades of Purity:** Epitaxial 99 999+%
  Pure 99 99 +%, Technical
- 10 2 **Storage Temperature:** Ambient
- 10 3 **Inert Atmosphere:** Padded
- 10 **Venting.** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12 HAZARD CLASSIFICATIONS

- 12 1 **Code of Federal Regulations:** Corrosive liquid
- 12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
- 12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13 1 **Physical State at 15°C and 1 atm** Liquid
- 13 2 **Molecular Weight:** 250 5
- 13 3 **Boiling Point at 1 atm:** 196°F = 91°C = 364°K
- 13 4 **Freezing Point:** −51°F = −46°C = 227°K
- 13 5 **Critical Temperature:** Not pertinent
- 13 6 **Critical Pressure:** Not pertinent
- 13 7 **Specific Gravity:** 2 645 at 20°C (liquid)
- 13 8 **Liquid Surface Tension:** 29 1 dynes/cm = 0 0291 N/m at 22°C
- 13 9 **Liquid-Water Interfacial Tension.** Not pertinent
- 13 10 **Vapor (Gas) Specific Gravity:** 8 64
- 13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 140
- 13 12 **Latent Heat of Vaporization.** 52 Btu/lb = 29 cal/g = 1 2 × 10⁵ J/kg
- 13 13 **Heat of Combustion:** Not pertinent
- 13 14 **Heat of Decomposition** Not pertinent
- 13 15 **Heat of Solution:** Data not available
- 13 16 **Heat of Polymerization:** Not pertinent

(Continued on reverse side)

NOTES

BRT — BORON TRICHLORIDE

Common Synonyms	Liquid	Colorless	Irritating odor

Reacts violently with water Irritating visible vapor cloud is produced Boiling point is 54° F

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
[illegible] exposed containers to water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
[illegible]
If affected eyes with plenty of water
IF IN EYES hold lids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Boron chloride
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** BCl_3
3 4 **IMCO/United Nations Numerical Designation:** 2/1741

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Acrid and irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Chemical goggles rubber protective clothing and gloves self contained breathing apparatus
5 2 **Symptoms Following Exposure:** Inhalation causes edema and severe irritation of the upper respiratory system Contact with liquid causes acid burns of eyes and severe burns of skin Ingestion causes severe burns of mouth and stomach
5 3 **Treatment for Exposure:** INHALATION remove to fresh air, give oxygen or apply artificial respiration Keep warm, call a doctor at once observe for pulmonary edema EYES wash with plenty of water for 15 min consult an eye specialist SKIN wash off with plenty of water INGESTION: do NOT induce vomiting give large amount of water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Grade 2, LD_{50} 0.5 to 5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury They cannot be tolerated even at low concentrations
5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third degree burns on short contact and is very injurious to the eyes
5 10 **Odor Threshold:** Decomposes in moist air, releasing hydrochloric acid and decomposition products Hydrochloric acid 1 ppm

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fi** Toxic fumes of hydrogen chloride are given off upon contact with water applied to adjacent fires
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously to liberate heat and forms hydrogen chloride fumes (hydrochloric acid) and boric acid
7 2 **Reactivity with Common Materials:** Vigorously attacks elastomers and packing materials Viton Tygon, Saran or silastic elastomers and natural and synthetic rubbers are not recommended for service Lead and graphite impregnated asbestos are to be avoided In the presence of moisture highly corrosive to most metals
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water rinse with sodium bicarbonate or solution
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Kerr McGee Chemical Corp
Kerr McGee Building
Oklahoma City Okla [illegible]
2 Matheson Gas Products Co
East Rutherford N J 07073
3 Union Carbide Corp
Linde Division
270 Park Avenue
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** C P (99 9+%)
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting.** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C-O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas
13 2 **Molecular Weight:** 117 2
13 3 **Boiling Point at 1 atm:** 54 3°F = 12 4°C = 285 6°K
13 4 **Freezing Point:** −161°F = −107°C = 166°K
13 5 **Critical Temperature:** 352°F = 178°C = 451°K
13 6 **Critical Pressure.** 566 psia = 38 Natm = 3 90 MN/m²
13 7 **Specific Gravity:** 1 35 at 11°C (liquid)
13 8 **Liquid Surface Tension.** 15 7 dynes/cm = 0 0157 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 4
13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 1470
13 12 **Latent Heat of Vaporization** 68 8 Btu/lb = 38 2 cal/g = 1 60 × 10⁵ J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** −13 000 Btu/lb = −7 200 cal/g = −300 × 10³ J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BRX	# BROMINE

Common Synonyms

Watery liquid | Reddish-brown | Sharp irritating odor

Sinks in water. Irritating brown vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber clothing (including gloves).
Stop discharge if possible.
Notify local health and pollution control agencies.

Fire

Not flammable.
May cause fire or contact with combustibles.
POISONOUS GASES ARE PRODUCED IN FIRE.
Contact with powdered metals, organics, finely divided combustibles.
Wear goggles, self-contained breathing apparatus and rubber clothing.
Use water spray to keep fire exposed containers cool.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause coughing, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration. Use NOT mouth-to-mouth.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, air contaminant.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Halogen
3 3 **Chemical Formula:** Br_2
3 4 **IMCO/United Nations Numerical Designation.** 8 0/1744

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Dark red/red brown
4 3 **Odor:** Sharp, harsh, penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical safety goggles, face shield, self-contained air line canister mask, rubber suit.
5 2 **Symptoms Following Exposure:** SKIN contact with liquid or vapor may cause acne and slow healing ulcers. INHALATION induces severe irritation of the respiratory passages and pulmonary edema. Probable lethal oral dose for an adult is 1 ml. A brief exposure to 1000 ppm may be fatal.
5 3 **Treatment for Exposure:** SKIN AND EYES: wash well with water and sodium bicarbonate solution. RESPIRATORY SYSTEM: if there is obstruction to breathing, establish airway by pulling tongue forward, inserting an airway tube or doing a tracheostomy, begin artificial respiration if difficulty in breathing is a result of pulmonary edema, treatment should be carried out with the patient in the sitting position. Administration of oxygen is most important. INGESTION: do not induce vomiting. If conscious, drink water and milk.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm
5 5 **Short-Term Inhalation Limits:** 0.4 ppm for 30 min
5 6 **Toxicity by Ingestion:** Not pertinent
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics.** Causes severe eye or throat irritations which can cause eye or lung injury; cannot be tolerated even at low concentrations.
5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eyes.
5 10 **Odor Threshold:** 3.5 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Use water spray to cool exposed containers and to wash away spills.
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated when heated or in fires.
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable.

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Reacts violently with aluminum. May cause fire in contact with wood, cotton, straw. Iron, steel, stainless steel, and copper are corroded by bromine and are especially subject to attack by wet bromine. Of the plastics only those which are highly fluorinated resist bromine attack.
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 30 ppm/10 hr/Gadophora killed fresh water. 10 ppm */fish irritant/salt water. *Time period not specified.
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Not pertinent
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Arkansas Chemicals Inc
El Dorado, Arkansas 71730
2 Bromet Co
Magnolia, Arkansas 71753
3 Dow Chemical Co
Midland, Michigan 48640

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial, technical
10 2 **Storage Temperature:** Cool but above 20°F to prevent freezing
10 3 **Inert Atmosphere.** Data not available
10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 448-3)

A P-X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive material
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	1
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 159.81
13 3 **Boiling Point at 1 atm.** 138°F = 58.8°C = 332°K
13 4 **Freezing Point:** 19°F = −7.2°C = 266°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 3.12 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 41 dynes/cm = .041 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** 5.5 at 20°C
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.3
13 12 **Latent Heat of Vaporization:** 80.6 Btu/lb = 44.7 cal/g = 1.88 × 10⁵ J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BPF	# BROMINE PENTAFLUORIDE

Common Synonym	Liquefied gas	Colorless	Irritating odor
	Reacts violently with water Poisonous vapor is produced		

No ignition sources if possible. Keep people away.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
May cause fire on contact with combustibles
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Wear goggles and self-contained breathing apparatus
DO NOT USE WATER OR FOAM ON FIRE

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (two glasses)
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** BrF_5
3 4 **IMCO/United Nations Numerical Designation:** 9/1745

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied gas
4 2 **Color:** Colorless
4 3 **Odor:** Highly irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber suit and gloves
5 2 **Symptoms Following Exposure:** Chemical is highly corrosive and toxic. Inhalation causes severe burns of mucous membrane. Ingestion causes severe burns of mouth. Contact with eyes or skin causes severe burns.
5 3 **Treatment for Exposure:** *Get medical attention IMMEDIATELY for any exposure to this chemical, even if no adverse effects are evident.* INHALATION: remove victim from area, apply artificial respiration if breathing has ceased. INGESTION: give large amount of water. EYES: wash with copious amounts of water for 15 min. SKIN: wash with large amounts of water and follow with lime water; remove contaminated clothing.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

Chemical is strong oxidizer and may cause fire in contact with organic materials such as wood, cotton or straw.

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water or foam on adjacent fires
6 5 **Special Hazards of Combustion Products:** Toxic and irritating fumes of hydrogen fluoride and bromine may form in fires
6 6 **Behavior in Fire:** Containers may burst when exposed to heat of fire
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently with water, evolving hydrogen fluoride an extremely irritating and corrosive gas
7 2 **Reactivity with Common Materials:** Reacts violently with many metals and materials of construction such as wood, glass, some plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Union Carbide Corp
Linde Division
270 Park Avenue
New York, N Y 10017

2 Gallard-Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place, N Y 11514

3 Pfaltz and Bauer, Inc
126-04 Northern Blvd
Flushing, N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical 98.0+
Pure 99.9%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Padded
10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O 7

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizer
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	3
	W (OX)

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 174.9
13 3 **Boiling Point at 1 atm.:** 106°F = 41°C = 314°K
13 4 **Freezing Point:** −76°F = −60°C = 213°K
13 5 **Critical Temperature:** 387°F = 19°C = 470°K
13 6 **Critical Pressure:** Data not available
13 7 **Specific Gravity:** 2.48 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 6.03
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.059 at 25°C
13 12 **Latent Heat of Vaporization:** 76.8 Btu/lb = 42.7 cal/g = 1.79 × 10⁵ J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

BTF — BROMINE TRIFLUORIDE

Common Synonyms

Liquid Colorless Extremely irritating odor

Reacts violently with water: Poisonous gas is produced on contact with water. Freezing point is 28° F

AVOID CONTACT WITH LIQUID AND VAPOR
[illegible]
Stay upwind
Ventilate
Keep unprotected personnel away
Notify local health and fire officials

Fire

Not flammable
May cause fire on contact with combustibles
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Water spray may be ineffective
Extinguish with dry chemicals, carbon dioxide
DO NOT USE WATER OR FOAM ON FIRE

Exposure

CALL FOR MEDICAL AID

VAPOR

POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air
Breathing difficulty may be relieved with [illegible]
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID

POISONOUS IF SWALLOWED
Will burn skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open, flush with plenty of water
IF SWALLOWED, do not induce VOMITING unless victim is conscious. Have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive, air contaminant
Restrict access
Evacuate area
Disperse and flush

2 LABELS





3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** BrF_3
3 4 **IMCO/United Nations Numerical Designation.** 9/1746

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Colorless to gray-yellow
4 3 **Odor:** Extremely irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, complete protective clothing, safety glasses, face shield
5 2 **Symptoms Following Exposure.** Inhalation causes severe irritation of upper respiratory system. Contact with liquid or vapor causes severe burns of eyes and can cause severe and blindness. Contact with skin causes severe burns. Ingestion causes severe burns of mucous membranes.
5 3 **Treatment for Exposure:** Get immediate medical attention for all exposures. INHALATION: remove from exposure, support respiration. EYES: irrigate with copious amounts of water for at least 15 min. SKIN: wash with large amounts of water for at least 15 min, then rinse with sodium bicarbonate or lime solution.
5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0.1 ppm (suggested)
5 5 **Short-Term Inhalation Limits:** 50 ppm/30 min; 100 ppm/3 min
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** Not flammable but may cause fire on contact with combustibles
6 2 **Flammable Limits in Air.** Not flammable
6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6 5 **Special Hazards of Combustion Products.** Data not available
6 6 **Behavior in Fire:** Forms very toxic and irritating fume
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously to generate toxic hydrogen fluoride gas (hydrofluoric acid)
7 2 **Reactivity with Common Materials:** Will cause severe corrosion of common metals and glass. May cause fire in contact with organic materials such as wood, cotton or straw
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with sodium bicarbonate or lime solution
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Matheson Gas Products Co
East Rutherford, N J 07073

2 Union Carbide Corp
Linde Division
270 Park Avenue
New York, N Y 10017

3 Air Products and Chemicals Inc
Specialty Gas Department
P O Box 538
Allentown, Pa 18105

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-[illegible])

A O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Oxidizer
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 136.9
13 3 **Boiling Point at 1 atm:** 258.4°F = 125.8°C = 399.0°K
13 4 **Freezing Point:** 47.3°F = 8.5°C = 282.0°K
13 5 **Critical Temperature.** (est) 621°F = 327°C = 600°K
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.81 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 26.3 dynes/cm = 0.0363 N/m at 23°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 4.7
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.1428
13 12 **Latent Heat of Vaporization:** 130 Btu/lb = 74 cal/g = 3.1 × 10⁵ J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

BBZ BROMOBENZENE

Common Synonyms
Monobromobenzene
Phenyl bromide
Bromobenzol

Liquid | Colorless | Pleasant odor

Sinks in water

Fire

Combustible

Exposure

LIQUID

Irritating to skin and eyes.
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Monobromobenzene
Phenyl bromide
Bromobenzol

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** C_6H_5Br

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield, rubber gloves and apron

5 2 **Symptoms Following Exposure:** Contact with liquid causes irritation of eyes and mild irritation of skin. Ingestion causes mild irritation of mouth and stomach

5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: induce vomiting, consult a doctor

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 124°F C C

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Irritating hydrogen bromide and other gases may be produced in fire

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature:** 1049°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 3.8 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich. 48640

2 Great Lakes Chemical Corp
P. O. Box 2200
West Lafayette, Ind. 47906

3 Michigan Chemical Corp
351 East Ohio Street
Chicago, Ill. 60611

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A A 1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 157

13 3 **Boiling Point at 1 atm:** 313°F = 156°C = 429°K

13 4 **Freezing Point:** −23.1°F = −30.6°C = 242.6°K

13 5 **Critical Temperature:** 747°F = 397°C = 670°K

13 6 **Critical Pressure:** 655 psia = 44.6 atm = 4.52 MN/m

13 7 **Specific Gravity:** 1.49 at 25°C (liquid)

13 8 **Liquid Surface Tension.** 36 dynes/cm = 0.036 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 5.4

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.0931

13 12 **Latent Heat of Vaporization:** 104 Btu/lb = 58 cal/g = 2.4 × 10⁵ J/kg

13 13 **Heat of Combustion:** 8,510 Btu/lb = 4,730 cal/g = 198 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BRU	# BRUCINE

Common Synonyms
10,11-Dimethoxystrychnine
(-)-Brucine dihydrate

Solid | White | Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear full respiratory and eye protection.
Stop leak if possible without risk.
Isolate area until gas has dispersed.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Water may be ineffective.
Fight fire from protected location or maximum distance.

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Prevent dust cloud.
Cover powder spill with plastic sheet or tarp.
Use water spray to reduce vapors.

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
If swallowed will cause nausea and vomiting
Avoid skin contact.
Do not get in eyes, on skin, on clothing.
IF IN EYES, flush with plenty of water for at least 15 minutes.
IF SWALLOWED and CONSCIOUS, have victim rinse mouth, drink water, repeat.
IF SWALLOWED and UNCONSCIOUS OR HAVING CONVULSIONS
Do not induce vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Brucine dihydrate
10,11 Dimethoxystrychnine

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{23}H_{26}N_2O_4$ or $C_{23}H_{26}N_2O_4 \cdot 2H_2O$

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1570

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Chemical is toxic if inhaled, swallowed, or absorbed through skin. Inhalation produces intense bitter taste. Ingestion causes nausea, vomiting, restlessness, excitement, twitching, and (rarely) convulsions. Contact with dust irritates eyes.

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure. INGESTION: induce vomiting, get medical attention at once. EYES: flush with water for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral rat LD_{50} = 1 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen may form in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** Possible bioaccumulation problem for the duration of 1 week

9. SELECTED MANUFACTURERS

1. Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N.Y. 11514
2. Aldrich Chemical Co
940 W. Saint Paul Ave
Milwaukee, Wis. 53233
3. Norse Laboratories, Inc.
2038 Alameda Padre Serra
Santa Barbara, Calif. 93103

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

J1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight.** 394.4

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 352°F = 178°C = 451°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** >1 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −13 400 Btu/lb = −7 440 cal/g = −311 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page Card A

NOTES

BDI

BUTADIENE, INHIBITED

Common Synonyms
Divinyl
Vinylethylene
1,3-Butadiene

Liquefied compressed gas Colorless Gasoline-like odor

Floats and boils on water. Flammable vapor cloud is produced.

Avoid contact with liquid and gas. Keep people away.
Many cases of contained area fires, application of rubber over leaking gas cylinder, specially trained personnel only.
Stop flow of gas if possible.
Evacuate area of unprotected personnel.
Use water spray to disperse vapor.
Isolate and ventilate discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Many cases of contained area fires, application of rubber over leaking gas cylinder, specially trained personnel only.
Stop flow of gas if possible.
Evacuate area of unprotected personnel.
Use water spray to disperse vapor.
Isolate and ventilate discharged material.
Notify local health and pollution control agencies.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
Move to fresh air.

LIQUID
Irritating to skin and eyes.
Remove contaminated clothing.
Flush affected area with plenty of water.
IN EYES, hold eyelids open and flush with plenty of water.

Water Pollution

Not harmful to aquatic life.
May be dangerous if it enters water intakes.
Notify downstream users of spill.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning, high flammability.
Evacuate area.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Biethylene
1,3-Butadiene
Bivinyl
Divinyl
Vinylethylene

3.2 **Coast Guard Compatibility Classification:** Olefin

3.3 **Chemical Formula:** $CH_2CHCHCH_2$

3.4 **IMCO United Nations Numerical Designation:** 2.0 1010

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Gas

4.2 **Color:** Colorless

4.3 **Odor:** Mildly aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles, rubber boots and gloves. When entering confined storage space, man must wear self-contained breathing apparatus (rubber mask with canister not adequate).

5.2 **Symptoms Following Exposure:** Slight anesthetic effect. High concentrations cause loss of consciousness, asphyxiation, and death. Liquid causes skin irritation and frostbite.

5.3 **Treatment for Exposure:** Remove victim from exposure immediately. Call a physician. INHALATION: If breathing is irregular or stopped, start resuscitation, administer oxygen. SKIN CONTACT: Remove contaminated clothing and wash affected skin area. EYE CONTACT: Irrigate with water for 15 minutes.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1,000 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes slight smarting or burning of eyes, nose, and throat at concentrations of 2,000 ppm and above. Effects increase rapidly as concentration increases. Severe irritation and pulmonary edema may occur at concentrations of 8,000 ppm and above.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If pulled into clothing and allowed to remain, may cause severe and reddening of the skin because of evaporation.

5.10 **Odor Threshold:** 4 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point:** −105°F (−76°C) (TCC)

6.2 **Flammable Limits in Air:**
2.0% to 11.5%

6.3 **Fire Extinguishing Agents:** Stop flow of gas.

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.

6.5 **Special Hazards of Combustion Products:** Not pertinent.

6.6 **Behavior in Fire:** Vapors heavier than air and may travel a considerable distance to source of ignition and flash back. Containers may explode in fire due to polymerization.

6.7 **Ignition Temperature:** 788°F (420°C)

6.8 **Electrical Hazard:** Class I, Group B

6.9 **Burning Rate:** Moderate

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Explosive decomposition when contaminated with peroxides formed by reaction with air.

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization:** Violent when inhibitors present.

7.6 **Inhibitor of Polymerization:** tert-Butylcatechol at 0.02%

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Not pertinent.

8.2 **Waterfowl Toxicity:** Not pertinent.

8.3 **Biological Oxygen Demand (BOD):** Not pertinent.

8.4 **Food Chain Concentration Potential:** Not pertinent.

9. SELECTED MANUFACTURERS

1. Neches Butane Products Co.
Port Neches, Texas 77651
2. Petro-Tex Chemical Corp.
Houston, Texas 77017
3. Phillips Petroleum Co.
Bartlesville, Oklahoma 74004

10 SHIPPING INFORMATION

10.1 **Grades of Purity:**

Research grade	99.5% min.
Special purity	99.0% min.
Rubber grade	99.0% min.
Commercial	95%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement.

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

ABCDEFGZ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	
Poison	
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 54.09

13.3 **Boiling Point at 1 atm:**
24.1°F = −4.4°C = 268.8°K

13.4 **Freezing Point:**
−164°F = −108.9°C = 164.2°K

13.5 **Critical Temperature:**
306°F = 152°C = 425°K

13.6 **Critical Pressure:**
628 psia = 42.7 atm = 4.32 MN/m²

13.7 **Specific Gravity:** 0.621 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
1.64 dynes/cm = 0.0016 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
(est.) 65 dynes/cm = 0.065 N/m at 22°C

13.10 **Vapor (Gas) Specific Gravity:** 1.87 at 20°C

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1

13.12 **Latent Heat of Vaporization:**
190 Btu/lb = 100 cal/g = 4.19 × 10⁵ J/kg

13.13 **Heat of Combustion:**
−19,000 Btu/lb = −10,600 cal/g
= −443 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent.

13.15 **Heat of Solution:** Not pertinent.

13.16 **Heat of Polymerization:** −549 Btu/lb
= −305 cal/g = −12.8 × 10⁵ J/kg

Continued on page 5 and 6

NOTES

REVISED 1978

BUT	BUTANE

Common Synonyms
n-Butane

Liquefied compressed gas Colorless Gasoline-like odor

Floats and boils on water. Flammable, vapor cloud is formed

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
If inhaled, will cause dizziness or difficult breathing
Not irritating to eyes, nose or throat

LIQUID
Will cause frostbite

Water Pollution

Not harmful to aquatic life
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Butane

3.2 **Coast Guard Compatibility Classification:** Paraffin

3.3 **Chemical Formula:** C_4H_{10}

3.4 **IMCO United Nations Numerical Designation:** 2.0-0

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Gasoline-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus and rubber gloves

5.2 **Symptoms Following Exposure:** Headache, dizziness, loss of coordination, and other effects of anesthesia

5.3 **Treatment for Exposure:** ORAL AND ASPIRATION: Not applicable. In case of INHALATION: Get victim to fresh air. Keep victim warm and rested. Artificial respiration and oxygen if breathing is difficult. Call a doctor. Do not leave victim unattended. Keep victim under observation. Symptoms may be delayed.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 800 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** Not applicable. Practically harmless to skin. Liquid and vapor are quickly dissipated by evaporation.

5.0 **Odor Threshold:** 2 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** -60°F (Estimated)

6.2 **Flammable Limits in Air:** 1.8% - 8.4%

6.3 **Fire Extinguishing Agents:** Not applicable (gas)

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 900°F

6.8 **Electrical Hazard:** Class I (Group D)

6.9 **Burning Rate:** 2.9 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Navco Butane Products Co., Port Neches, Texas 77651
2. Petro-Tex Chemical Corp., Houston, Texas 77001
3. Phillips Petroleum Co., Bartlesville, Oklahoma 74003

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Research 99.9% Pure, 95+% Technical 95.6%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Nitrogen, Argon

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A B C D E F G

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effects	0
Reactivity	
Other Chemicals	0
Water	0
Self-Reactivity	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Gas

13.2 **Molecular Weight:** 58.12

13.3 **Boiling Point at 1 atm.:** 31.1°F (-0.5°C) = 272.7°K

13.4 **Freezing Point:** -216.9°F (-138.3°C) = 134.8°K

*13.5 **Critical Temperature:** 305.6°F (152.0°C) = 425°K

13.6 **Critical Pressure:** 548.9 psia = 37.4 atm = 3.79 MN/m²

13.7 **Specific Gravity:** 2.07 at 0°C (liquid)

13.8 **Liquid Surface Tension:** 4.7 dynes/cm = 0.0047 N/m at 0°C

13.9 **Liquid-Water Interfacial Tension:** 50.85 dynes/cm = 0.05085 N/m at 22°C

13.10 **Vapor (Gas) Specific Gravity:** 2.0 at 0°C

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.094

13.12 **Latent Heat of Vaporization:** 170 Btu/lb = 94.4 cal/g = 395 J/g

13.13 **Heat of Combustion:** -21,232 Btu/lb = -11,796 cal/g = -493.6 kJ/g

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

*13.16 **Heat of Polymerization:** Not pertinent

* Recommended

NOTES

REVISED 1978

BDO	# 1,4-BUTANEDIOL

Common Synonyms 1,4-dihydroxybutane Tetramethylene glycol	Thick liquid	Colorless	Odorless
	Sinks and mixes with water. Freezing point is 68° F		

[illegible]

Fire	**Combustible** [illegible]
Exposure	CALL FOR MEDICAL AID **LIQUID OR SOLID** **Irritating to skin or eyes.** **Harmful if swallowed** [illegible]
Water Pollution	**Effect of low concentrations on aquatic life is unknown.** **May be dangerous if it enters water intakes.** [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-6)

Dispersal, flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
1,4-Dihydroxybutane
Tetramethylenediol

3.2 **Coast Guard Compatibility Classification:**
Alcohols

3.3 **Chemical Formula:** HOCH$_2$CH$_2$CH$_2$CH$_2$OH

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protection

5.2 **Symptoms Following Exposure:** Does not irritate eyes, skin needed to prevent acute symptoms

5.3 **Treatment for Exposure:** SKIN OR EYES: wash with [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2 LD[illegible]

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** None

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 250°F O.C.

6.2 **Flammable Limits in Air:**
Data not available

6.3 **Fire Extinguishing Agents**
Alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**
Water or air-aspirating foams

6.5 **Special Hazards of Combustion Products.**
Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

GAF Corporation
Chemical Division
[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Research grade 99+
Industrial grade 99.3

10.2 **Storage Temperature:**
Not [illegible]

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3)

NPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 90.12

13.3 **Boiling Point at 1 atm:**
442°F = 228°C = 501°K

13.4 **Freezing Point:**
68°F = 20°C = 293°K

13.5 **Critical Temperature:**
[illegible]

13.6 **Critical Pressure:**
[illegible]

13.7 **Specific Gravity:** 1.017 at 20°C (Liquid)

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent

13.12 **Latent Heat of Vaporization:**
Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

[illegible]

NOTES

BUD — 1,4-BUTENEDIOL

Common Synonyms
2-Butene-1,4-diol
1,4-Dihydroxy 2-butene

Thick liquid | Light yellow | Odorless

Sinks and mixes with water. Freezing point is 45° F.

Fire

Combustible

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water.
Induce vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Dispersal and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
cis-2-Butene-1,4-diol
1,4-Dihydroxy-2-butene

3.2 Coast Guard Compatibility Classification:
Not applicable

3.3 Chemical Formula:
$HOCH_2CH{=}CHCH_2OH$

3.4 IMCO United Nations Numerical Designation: 1759

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid

4.2 Color: Pale yellow

4.3 Odor: Odorless

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Excursion

5.2 Symptoms Following Exposure: Data not available

5.3 Treatment for Exposure: SKIN OR EYE CONTACT: Flush with plenty of water for at least 15 minutes. Get medical attention if irritation persists.

5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent

5.5 Short-Term Inhalation Limits: Not pertinent

5.6 Toxicity by Ingestion: Grade 2. Dihydroxybutene

5.7 Late Toxicity: Data not available

5.8 Vapor (Gas) Irritant Characteristics: Not pertinent

5.9 Liquid or Solid Irritant Characteristics: Minimum. Not irritating at concentrations of 0.5% or less. Repeated skin contact may cause irritation and dermatitis. Contact with eyes may cause severe irritation requiring medical attention.

5.10 Odor Threshold: Not pertinent

6 FIRE HAZARDS

6.1 Flash Point: 265°F C.O.C.

6.2 Flammable Limits in Air:
Not pertinent

6.3 Fire Extinguishing Agents: Water, dry chemical or carbon dioxide

6.4 Fire Extinguishing Agents Not to be Used:
Foam or water stream may cause frothing

6.5 Special Hazards of Combustion Products:
Not pertinent

6.6 Behavior in Fire: Not pertinent

6.7 Ignition Temperature: Data not available

6.8 Electrical Hazard: Not pertinent

6.9 Burning Rate: Data not available

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction

7.2 Reactivity with Common Materials:
No reaction

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Stable

7.6 Inhibitor of Polymerization:
Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity:
Data not available

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD):
Data not available

8.4 Food Chain Concentration Potential:
None

9 SELECTED MANUFACTURERS

GAF Corporation
Chemical Division
Calvert City, Kentucky 42029

10. SHIPPING INFORMATION

10.1 Grades of Purity: 98%

10.2 Storage Temperature: Above 45°F

10.3 Inert Atmosphere: Desired

10.4 Venting: Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
Not listed

12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed

12.3 NFPA Hazard Classification:
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid

13.2 Molecular Weight: 88.1

13.3 Boiling Point at 1 atm.
442°F = 228°C = 501°K

13.4 Freezing Point: 45°F = 7°C = 280°K

13.5 Critical Temperature: Not pertinent

13.6 Critical Pressure: Not pertinent

13.7 Specific Gravity: 1.04 at 25°C (Liquid)

13.8 Liquid Surface Tension: Not pertinent

13.9 Liquid-Water Interfacial Tension:
Not pertinent

13.10 Vapor (Gas) Specific Gravity:
Not pertinent

13.11 Ratio of Specific Heats of Vapor (Gas):
Not pertinent

13.12 Latent Heat of Vaporization:
Not pertinent

13.13 Heat of Combustion: -10,300 Btu/lb = -5,722 cal/g = 23,950 J/g

13.14 Heat of Decomposition: Not pertinent

13.15 Heat of Solution:
Heat of Solution (Water) = Not pertinent

13.16 Heat of Polymerization: Not pertinent

(continued on page 2)

NOTES

BCN n-BUTYL ACETATE

Common Synonyms
Acetic acid, n-butyl ester
Butyl acetate
Butyl ethanoate

Watery liquid | Colorless | Pleasant fruity odor

Floats on water | Flammable irritating vapor is produced

Stop discharge if possible. Keep people away.
Wear protective clothing and self-contained breathing apparatus.
Avoid any skin contact.
Keep unauthorized personnel away. Isolate hazard area.
Prevent runoff from entering waterways.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemical, carbon dioxide, foam
Water may be ineffective
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause nausea, dizziness, headache or difficult breathing
Move victim to fresh air
If not breathing, give artificial respiration
If breathing is difficult, give oxygen
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing
Flush affected areas with plenty of water
IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water
Induce vomiting by touching back of throat
IF SWALLOWED and victim is UNCONSCIOUS OR CONVULSING DO NOTHING BY MOUTH

Water Pollution

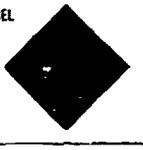
Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and pollution control agencies
Notify persons using water downstream

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Evacuate area
Maintain isolation

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Acetic acid butyl ester
Butyl acetate
Butyl ethanoate

3.2 **Coast Guard Compatibility Classification:**
B

3.3 **Chemical Formula:** $CH_3COOCH_2CH_2CH_2CH_3$

3.4 **IMCO United Nations Numerical Designation:** 1123

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic, pleasant, fruity odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear chemical protective clothing, boots and gloves. Wear self-contained breathing apparatus.

5.2 **Symptoms Following Exposure:** SKIN contact causes irritation. INHALATION causes irritation of the nose, throat and lungs, nausea, dizziness, headache or difficult breathing.

5.3 **Treatment of Exposure:** EYES Flush with plenty of water. INHALATION Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION Induce vomiting by touching back of throat. Call physician immediately.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 150 ppm

5.5 **Short-Term Inhalation Limits:** 200 ppm

5.6 **Toxicity by Ingestion:** Moderately Toxic

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes irritation of the eyes, nose and throat. Irritation is slight at 200 ppm and severe at 1000 ppm.

5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. Prolonged contact with liquid may cause irritation and reddening of the skin.

5.10 **Odor Threshold:** 1 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 90°F (32°C) TCC

6.2 **Flammable Limits in Air:**
1.7% - 7.6%

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.**
Water may be ineffective, can spread fire

6.5 **Special Hazards of Combustion Products.**
None known

6.6 **Behavior in Fire:** No permanent effect

6.7 **Ignition Temperature:** 760°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 4.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** None required

7.5 **Polymerization.** Will not occur

7.6 **Inhibitor of Polymerization:**
None required

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
44 ppm (48 hr) TL_m Mosquito fish

8.2 **Waterfowl Toxicity:** Practically non-toxic

8.3 **Biological Oxygen Demand (BOD)**
0.74 lb/lb (5 days)
1.51 lb/lb (20 days)

8.4 **Food Chain Concentration Potential.**
None

9 SELECTED MANUFACTURERS

Allied Chemical Corp.
General Chemical Div.
40 Rector St.
New York, NY 10006

Eastman Kodak Co.
Tennessee Eastman Co. Div.
P.O. Box 511
Kingsport, Tennessee 37662

Union Carbide Corp.
Chemicals and Plastics
270 Park Ave.
New York, NY 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 99% min.
Reagent ACS

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

ATT

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poison	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Marine Effect	2
Reactivity	
Other Chemicals	
Water	
Self Reaction	

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
Liquid

13.2 **Molecular Weight:** 116.2

13.3 **Boiling Point at 1 atm.**
399.1°F (204.5°C) = 477.7°K

13.4 **Freezing Point:**
-77.9°F (-78°C) = 195°K

13.5 **Critical Temperature:**
583.7°F (306.5°C) = 579.7°K

13.6 **Critical Pressure:**
Data not available

13.7 **Specific Gravity:** 0.8825 at 20°/20°C

13.8 **Liquid Surface Tension:**
24.9 dynes/cm = 0.0249 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:**
8.5 dynes/cm = 0.0085 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity**
4.01 (Air = 1)

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.08

13.12 **Latent Heat of Vaporization.** 150 Btu/lb = 83.3 cal/gm = 348.7 kJ/kg

13.13 **Heat of Combustion.** -13,900 Btu/lb = -7720 cal/gm = -32,300 kJ/kg

13.14 **Heat of Decomposition:** None

13.15 **Heat of Solution.** None

13.16 **Heat of Polymerization:** None

Data at 25°C (77°F) unless otherwise noted

NOTES

REVISED 1978

BTA	sec-BUTYL ACETATE

Common Synonyms
Acetic acid
Sec-butyl ester

Watery liquid | Colorless | Pleasant, fruity odor

Floats on water. Flammable. Irritating vapor is produced.

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, headache or difficult breathing.
[illegible]

LIQUID
Irritating to skin and eyes.
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

[illegible]

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms. [illegible]
3.2 Coast Guard Compatibility Classification.
3.3 Chemical Formula
[illegible]
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment. [illegible]
5.2 Symptoms Following Exposure: [illegible]
5.3 Treatment for Exposure. INHALATION [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold

6 FIRE HAZARDS

6.1 Flash Point.
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products.
6.6 Behavior in Fire.
6.7 Ignition Temperature:
6.8 Electrical Hazard
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials.
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity
8.2 Waterfowl Toxicity
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10.1 Grades of Purity: Technical and Pure
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.
12.2 NAS Hazard Rating for Bulk Water Transportation.

Category	Rating
[illegible]	

12.3 NFPA Hazard Classifications:

Category	Classification
[illegible]	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm.
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization.

NOTES

REVISED 1978

BAI

iso-BUTYL ACRYLATE

Common Synonyms
Isobutyl 2-propenoate
2-propenoic acid, isobutyl ester

Watery liquid | Colorless | Sharp fragrant odor

Floats on water. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.

1. RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms:

3.2 Coast Guard Compatibility Classification:
Acrylate

3.3 Chemical Formula:
$CH_2=CHCOOCH_2CH(CH_3)_2$

3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):

4.2 Color:

4.3 Odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:

5.2 Symptoms Following Exposure:

5.3 Treatment for Exposure: INHALATION

INGESTION

SKIN

5.4 Toxicity by Inhalation (Threshold Limit Value):

5.5 Short-Term Inhalation Limits:

5.6 Toxicity by Ingestion:

5.7 Late Toxicity:

5.8 Vapor (Gas) Irritant Characteristics:

5.9 Liquid or Solid Irritant Characteristics:

5.10 Odor Threshold.

6 FIRE HAZARDS

6.1 Flash Point:

6.2 Flammable Limits in Air:

6.3 Fire Extinguishing Agents:

6.4 Fire Extinguishing Agents Not to be Used:

6.5 Special Hazards of Combustion Products:

6.6 Behavior in Fire:

6.7 Ignition Temperature:

6.8 Electrical Hazard:

6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water.

7.2 Reactivity with Common Materials:

7.3 Stability During Transport:

7.4 Neutralizing Agents for Acids and Caustics:

7.5 Polymerization:

7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:

8.2 Waterfowl Toxicity:

8.3 Biological Oxygen Demand (BOD):

8.4 Food Chain Concentration Potential.

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:

10.2 Storage Temperature:

10.3 Inert Atmosphere

10.4 Venting:

11 HAZARD ASSESSMENT CODE

ATLZ

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	
Health	
Vapor Hazard	
Liquid and Solid Hazard	
Poison	
Water Pollution	
Reactivity	
Water	
Mixed Reaction	

12.3 NFPA Hazard Classifications:

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm:

*13.2 Molecular Weight:

*13.3 Boiling Point at 1 atm:

*13.4 Freezing Point:

*13.5 Critical Temperature:

*13.6 Critical Pressure:

*13.7 Specific Gravity:

*13.8 Liquid Surface Tension:

*13.9 Liquid-Water Interfacial Tension:

*13.10 Vapor (Gas) Specific Gravity:

*13.11 Ratio of Specific Heats of Vapor (Gas)

*13.12 Latent Heat of Vaporization.

*13.13 Heat of Combustion:

*13.14 Heat of Decomposition:

*13.15 Heat of Solution:

*13.16 Heat of Polymerization:

NOTES

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BTC n-BUTYL ACRYLATE

Common Synonyms
Butyl acrylate
n-Butyl 2-propenoate
Acrylic acid, n-butyl ester

Watery liquid | Colorless | Sharp, fragrant odor

Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Containers may explode in fire
Extinguish with dry chemical, foam or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing at once
Flush affected areas with plenty of water
IF IN EYES, hold eyelids apart and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS, have victim drink water or milk
IF NOT ALLOWED to drink or UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except transport victim

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and pollution control agencies
Notify agencies downwind of accidental release

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Acrylic acid, butyl ester
Butyl acrylate
Butyl propenoate

3 2 **Coast Guard Compatibility Classification**
Acrylate

3 3 **Chemical Formula**
$CH_2=CHCOOCH_2CH_2CH_2CH_3$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color** Colorless
4 3 **Odor.** Characteristic acrylic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber gloves and goggles
5 2 **Symptoms Following Exposure.** Vapor is irritating, which if breathed at high concentrations, Contact with liquid causes irritation of skin and burning of eyes
5 3 **Treatment for Exposure** INHALATION remove to fresh air, administer artificial respiration or oxygen if indicated, call a physician SKIN AND EYES wash with plenty of water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits** LD$_0$ 1000 ppm 4 hr
5 6 **Toxicity by Ingestion** Grade 2, 0.5 to 5 g/kg (rat)
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 118°F O.C.
6 2 **Flammable Limits in Air:**
1.45 - 9.45
6 3 **Fire Extinguishing Agents**
Dry chemical, foam or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used**
Not pertinent
6 5 **Special Hazards of Combustion Products**
Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature** 534°F
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** 4.7 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials:**
No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Will polymerize on application of heat, uncontrolled bulk polymerization can be explosive
7 6 **Inhibitor of Polymerization:**
Methyl ether of hydroquinone
15-100 ppm. Store in contact with air

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)**
Data not available
8 4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1 Celanese Corp
Celanese Chemical Co. Division
245 Park Ave
New York, N.Y. 10017

2 Rohm and Haas Co
Independence Mall West
Philadelphia, Pa. 19105

3 Union Carbide Corp
Chemicals and Plastic Div
270 Park Ave
New York, N.Y. 10017

10. SHIPPING INFORMATION

10 1 **Grades of Purity** 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Pressure vent

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U-Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight** 128.17
13 3 **Boiling Point at 1 atm:**
295°F = 146.6°C = 422.9°K
13 4 **Freezing Point**
-83°F = -64°C = 209°K
13 5 **Critical Temperature:**
621°F = 327°C = 600°K
13 6 **Critical Pressure**
426 psia = 29 atm = 2.9 MN/m
13 7 **Specific Gravity:** 0.899 at 20°C (liquid)
13 8 **Liquid Surface Tension:**
(est.) 20 dynes/cm = 0.020 N/m at 27°C
13 9 **Liquid-Water Interfacial Tension:**
(est.) 60 dynes/cm = 0.060 N/m at 27°C
13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):**
1.05
13 12 **Latent Heat of Vaporization.**
120 Btu/lb = 66.4 cal/g = 2.78 × 10^5 J/kg
13 13 **Heat of Combustion** -13,660 Btu/lb
= -7900 cal/g = -322.4 × 10^5 J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.**
-259 Btu/lb = -144 cal/g
= -6.01 × 10^5 J/kg

Continued, page 5A-8

NOTES

REVISED 1978

BAN

n-BUTYL ALCOHOL

Common Synonyms
butanol
Butyl alcohol
1-Butanol
1-Hydroxybutane
n-Propylcarbinol

Watery liquid | Colorless | Alcohol odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with liquid and vapor.
May upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical or carbon dioxide.
Water and alcohol foam may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, headache, dizziness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Restrict access.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Butanol
Butyl alcohol
1-Butanol
1-Hydroxybutane
n-Propylcarbinol

3.2 **Coast Guard Compatibility Classification** Alcohol

3.3 **Chemical Formula** $CH_3(CH_2)_3OH$

3.4 **IMCO United Nations Numerical Designation** 3/1120

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Colorless

4.3 **Odor.** Alcohol-like, pungent, strong characteristic, mildly alcoholic, non-residual

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Organic vapor canister or air-supplied mask, chemical goggles or face splash shield

5.2 **Symptoms Following Exposure** Anesthesia, nausea, headache, dizziness, irritation of respiratory passages. Mildly irritating to the skin and eyes.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure immediately; call physician if breathing is irregular or has stopped; start resuscitation and administer oxygen. INGESTION: induce vomiting and call physician. EYES: flush with water for at least 15 minutes.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5.5 **Short-Term Inhalation Limits** 150 ppm for 30 min

5.6 **Toxicity by Ingestion** Grade 2; LD50 790 mg/kg (oral)

5.7 **Late Toxicity** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes slight smarting of the eyes or respiratory system. Irritation is experienced only at high concentrations. Effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics** Minimum hazard. If applied on clothing and allowed to remain, may cause burning and reddening of the skin.

5.10 **Odor Threshold** 2.8 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 84°F (C.C.) 97°F (O.C.)

6.2 **Flammable Limits in Air** 1.4 - 11.2

6.3 **Fire Extinguishing Agents** Carbon dioxide, dry chemicals

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** 650°F

6.8 **Electrical Hazard** Class I, Group D

6.9 **Burning Rate** 3.2 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 1000 ppm/24 hr/goldfish/died/fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):** 1.42 lb/lb/5 days, 1.87 lb/lb/5 days

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Div.
245 Park Ave.
New York, N.Y. 10017

2. Dow Badische Co.
Williamsburg, Virginia 23185

3. Union Carbide Corp.
Chemicals & Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity** 99+

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 74.12

13.3 **Boiling Point at 1 atm** 243.9°F = 117.7°C = 390.9°K

13.4 **Freezing Point.** 129.1°F = -89.5°C = 183.7°K

13.5 **Critical Temperature** 563.6°F = 295.3°C = 568.4°K

13.6 **Critical Pressure.** 640.2 psia = 43.58 atm = 4.412 MN/m²

13.7 **Specific Gravity** 0.8109 (20/4°C, liquid)

13.8 **Liquid Surface Tension** 24.6 dynes/cm = 0.0246 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.** 1.8 dynes/cm = 0.0018 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.083

13.12 **Latent Heat of Vaporization.** 256 Btu/lb = 142 cal/g = 5.9 × 10⁵ J/kg

13.13 **Heat of Combustion** -14,230 Btu/lb = -7906 cal/g = -33.1 × 10⁶ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization** Not pertinent

(continued on next page)

NOTES

REVISED 1978

BAS

sec-BUTYL ALCOHOL

Common Synonyms
2-Butanol
2-Hydroxybutane
Methylethylcarbinol

Watery liquid | Colorless | Alcohol odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid and vapor.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, carbon dioxide, water and alcohol foam as specific fire control.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause headache, dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to eyes.
If in eyes, wash with plenty of water.

Water Pollution

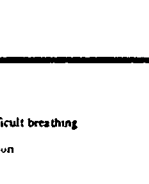
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and pollution control agencies.
Keep spray runoff from entering water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Restrict access.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
2-Butanol
Butylene Hydrate
2-Hydroxybutane
Methylethylcarbinol

3.2 **Coast Guard Compatibility Classification.**
Alcohol

3.3 **Chemical Formula:**
$CH_3CH_2CHOHCH_3$

3.4 **IMCO, United Nations Numerical Designation:** No. 1120

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Strong pleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Organic vapor canister or supplied mask; chemical safety goggles or face splash shield.

5.2 **Symptoms Following Exposure.** Headache, dizziness and respiratory irritation. Liquid is severely irritating to the eyes and can cause eye burn.

5.3 **Treatment for Exposure.** INHALATION: remove from exposure immediately; call a physician if breathing is irregular or has stopped; start resuscitation and administer oxygen. INGESTION: induce vomiting and call physician. EYES: flush with water for at least 15 minutes.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 150 ppm

5.5 **Short-Term Inhalation Limits.** 200 ppm for 60 min

5.6 **Toxicity by Ingestion:** Grade 1. Dose ketone: single oral dose.

5.7 **Late Toxicity.** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5.10 **Odor Threshold.** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point.** 75°F C.C.

6.2 **Flammable Limits in Air**
1.7% - 9.0%

6.3 **Fire Extinguishing Agents.** Carbon dioxide, dry chemical.

6.4 **Fire Extinguishing Agents Not to be Used.**
Not pertinent.

6.5 **Special Hazards of Combustion Products.**
Not pertinent.

6.6 **Behavior in Fire.** Not pertinent.

6.7 **Ignition Temperature.** 761°F

6.8 **Electrical Hazard.** Class I, Group D.

6.9 **Burning Rate.** 4.1 mm/min.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction.

7.2 **Reactivity with Common Materials.**
No reaction.

7.3 **Stability During Transport.** Stable.

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent.

7.5 **Polymerization.** Not pertinent.

7.6 **Inhibitor of Polymerization:**
Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity.**
Data not available.

8.2 **Waterfowl Toxicity.** Data not available.

8.3 **Biological Oxygen Demand (BOD).**
Data not available.

8.4 **Food Chain Concentration Potential.**
None.

9 SELECTED MANUFACTURERS

1. Exxon Chemical Co.
Houston, Texas 77001

2. Shell Chemical Co.
Industrial Chemicals Div.
Houston, Texas 77001

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity.** 99+

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement.

10.4 **Venting.** Open flame arrester or pressure vacuum.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A.P.Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Mixed Chemical	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**
Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight.** 74.12

13.3 **Boiling Point at 1 atm.**
211°F = 99.5°C = 372.7°K

13.4 **Freezing Point.**
-174.5°F = -114.7°C = 158.5°K

13.5 **Critical Temperature.**
505.0°F = 262.8°C = 536.0°K

13.6 **Critical Pressure.**
608.4 psia = 41.39 atm = 4.193 MN/m²

13.7 **Specific Gravity.** 0.807 at 20°C (liquid)

13.8 **Liquid Surface Tension.**
23.0 dynes/cm = 0.023 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.**
Data not available.

13.10 **Vapor (Gas) Specific Gravity.**
Not pertinent.

13.11 **Ratio of Specific Heats of Vapor (Gas).**
1.09

13.12 **Latent Heat of Vaporization.**
243 Btu/lb = 135 cal/g = 5.65 × 10⁵ J/kg

13.13 **Heat of Combustion.** -15,500 Btu/lb
= -8600 cal/g = -360 × 10⁵ J/kg

13.14 **Heat of Decomposition.** Not pertinent.

13.15 **Heat of Solution:**
Data not available.

13.16 **Heat of Polymerization.** Not pertinent.

Continued on page 5-sec-8.

NOTES

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BAT — tert-BUTYL ALCOHOL

Common Synonyms
2-Methyl-2-propanol
Trimethylcarbinol

Oily liquid | Colorless | Sharp alcohol odor

Floats and mixes with water. Flammable, irritating vapor is produced. Freezing point is 78° F

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose, throat
If inhaled, will cause dizziness, difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

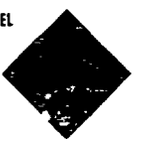
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
2-Methyl-2-propanol
Trimethylcarbinol
3 2 **Coast Guard Compatibility Classification:** Alcohol
3 3 **Chemical Formula:** $(CH_3)_3COH$
3 4 **IMCO/United Nations Numerical Designation** 3 3 1122

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
Sometimes freezes below 75°F
4 2 **Color:** Colorless
4 3 **Odor:** Characteristic camphor-like pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Air pack or organic canister mask, rubber gloves and goggles
5 2 **Symptoms Following Exposure:** Vapor is narcotic in action and irritating to respiratory passages. Liquid is irritating to skin and eyes
5 3 **Treatment for Exposure:** INHALATION: remove victim from exposure and restore breathing. SKIN/EYE CONTACT: remove liquid from skin with water. Flush eyes with water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm
5 5 **Short-Term Inhalation Limits:** 150 ppm for 30 min
5 6 **Toxicity by Ingestion.** Grade 2 0.5 to 5.0 g/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 52°F (C.C.) 57°F (O.C.)
6 2 **Flammable Limits in Air**
2.35% v/v
6 3 **Fire Extinguishing Agents**
Dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used**
Not pertinent
6 5 **Special Hazards of Combustion Products**
Not pertinent
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature:** 896°F
6 8 **Electrical Hazard.** Class I, Group D
6 9 **Burning Rate:** 4.3 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD):**
0% 5 days
8 4 **Food Chain Concentration Potential**
Not

9 SELECTED MANUFACTURERS

1 Eastman Kodak Co.
Rochester, N.Y. 14650
2 Shell Chemical Co.
Industrial Chemicals Div.
Houston, Texas 77001

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99+%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Open (flame arrester) or pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A.P.Q.R.S

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm**
Liquid
13 2 **Molecular Weight:** 74.12
13 3 **Boiling Point at 1 atm:**
181°F = 82.6°C = 355.8°K
13 4 **Freezing Point** 78.3°F = 25.7°C = 298.9°K
13 5 **Critical Temperature**
451°F = 233°C = 506°K
13 6 **Critical Pressure:**
576 psia = 39.2 atm = 3.97 MN/m²
13 7 **Specific Gravity:** 0.78 at 20°C (liquid)
13 8 **Liquid Surface Tension**
20.7 dynes/cm = 0.020 N/m at 25°C
13 9 **Liquid-Water Interfacial Tension**
Not pertinent
13 10 **Vapor (Gas) Specific Gravity** 2.6
13 11 **Ratio of Specific Heats of Vapor (Gas)**
1.080
13 12 **Latent Heat of Vaporization**
234 Btu/lb = 130 cal/g = 5.44 × 10⁵ J/kg
13 13 **Heat of Combustion:** −14 000 Btu/lb
= −7780 cal/g = −325.7 × 10⁵ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 with A

NOTES

REVISED 1978

BAM

n-BUTYLAMINE

Common Synonyms
1-Aminobutane
Butylamine
Mono-n-butylamine
Normalamine

Liquid Colorless Fishy, ammonia-like odor

Mixes with water

ALSO CONSULT WITH CHEMICAL MANAGER BEFORE PROCEEDING

Fire

Flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause dizziness, headache, coughing or difficult breathing

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

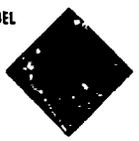
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, air contaminant, water contaminant
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** 1-Aminobutane
Butylamine, Mono-n-butylamine
Normalamine

3.2 **Coast Guard Compatibility Classification**
Aliphatic amine

3.3 **Chemical Formula:** $CH_3(CH_2)_3NH_2$

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1125

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Fish-like, ammonia-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask, rubber gloves, coverall, goggles, face shield, butyl rubber apron

5.2 **Symptoms Following Exposure** Inhalation causes irritation, nausea, vomiting, headache, faintness, severe coughing, and chest pains, can cause lung edema. Ingestion causes severe irritation of mouth and stomach. Contact with eyes causes severe irritation and edema of the cornea. Contact with skin causes burns; absorption through skin may cause nausea, vomiting and shock.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, call a physician, give oxygen if breathing is difficult, if not breathing, give artificial respiration. INGESTION: give large amounts of water, get medical attention. EYES: flush with water at least 15 min, get medical care. SKIN: remove contaminated clothing, flush skin with plenty of water at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits:** 5 ppm / 5 min

5.6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} = 500 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 30°F (O.C.) 10°F (C.C.)

6.2 **Flammable Limits in Air:** 1.7% - 9.8%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen may form in fire.

6.6 **Behavior in Fire.** Vapors heavier than air and may travel to a source of ignition and flash back. Containers may explode in fire.

6.7 **Ignition Temperature** 94°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.9 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** May corrode some metals in presence of water

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
30 - 70 ppm/24 hr/fresh/fish/critical range/fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)**
26.5% theo./5 days

8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Avenue
New York, N.Y. 10017

2. Virginia Chemicals Inc.
3340 West Norfolk Rd.
Portsmouth, Va. 23703

3. Air Products and Chemicals, Inc.
U.S. Highway 90
Pace, Fla. 32502

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure 100%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

VPQRS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 73.14

13.3 **Boiling Point at 1 atm:**
172.3°F = 77.4°C = 350.6°K

13.4 **Freezing Point:**
−96°F = −49.7°C = 224°K

13.5 **Critical Temperature**
484°F = 251°C = 524°K

13.6 **Critical Pressure:**
603 psia = 41 atm = 4.16 MN/m²

13.7 **Specific Gravity:** 0.741 at 20°C (liquid)

13.8 **Liquid Surface Tension**
23.11 dynes/cm = 0.02311 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.5

13.11 **Ratio of Specific Heats of Vapor (Gas).** (est.) 1.071

13.12 **Latent Heat of Vaporization** 191 Btu/lb = 106 cal/g = 4.2 × 10⁵ J/kg

13.13 **Heat of Combustion** −17,594 Btu/lb = −9,775 cal/g = −409.0 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 137 Btu/lb = 76.2 cal/g = 3.19 × 10⁵ J/kg

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5A

NOTES

BTL

sec-BUTYLAMINE

Common Synonyms

Liquid | White | Ammonia like odor

Mixes with water

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability air contaminant water contaminant
Restrict access
Disperse and Flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Aliphatic amine
3.3 **Chemical Formula.** $CH_3CH_2CH(NH_2)CH_3$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ammonia like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles rubber gloves and proper respirators protective equipment non sparking shoes
5.2 **Symptoms Following Exposure:** Inhalation causes irritation burns of the respiratory system exposure to concentrated vapors can cause asphyxiation Ingestion causes burns of mouth throat and stomach Contact with eyes causes lachrymation conjunctivitis burns corneal edema Contact with skin causes irritation or burns dermatitis
5.3 **Treatment for Exposure:** INHALATION remove patient from exposure keep him quiet call physician INGESTION give large amount of water induce vomiting consult physician EYES Flush thoroughly with water for 15 min call physician immediately SKIN remove all contaminated clothing flood affected area with large quantities of water consult physician
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limit:** Data not available
5.6 **Toxicity by Ingestion.** Grade 3 oral LD_{50} 500 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate to high concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third degree burns on skin contact and severe injurious to the eyes
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 16°F C.C.
6.2 **Flammable Limits in Air** Data not available
6.3 **Fire Extinguishing Agents** Alcohol foam dry chemical carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen may be formed in fire
6.6 **Behavior in Fire** Vapor is heavier than air and may travel to a source of ignition and flash back Container may explode in fire
6.7 **Ignition Temperature** 712 F
6.8 **Electrical Hazard** Data not available
6.9 **Burning Rate.** 6 IN/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials** May corrode some metals in presence of water
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Pennwalt Corporation
Three Parkways
Philadelphia Pa 19102
2. Virginia Chemicals Inc
3366 West Norfolk Rd
Portsmouth Va 23703
3. BASF Wyandotte Corp
1609 Biddle Avenue
Wyandotte MI 48192

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Pure
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Open flame pressure

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

VPQRS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	

HYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15° C and 1 atm** Liquid
13.2 **Molecular Weight:** 73.14
13.3 **Boiling Point at 1 atm:** 145°F = 63°C = 336°K
13.4 **Freezing Point:** −135°F = −103°C = 169°K
13.5 **Critical Temperature:** Data not available
13.6 **Critical Pressure.** Data not available
13.7 **Specific Gravity:** 0.7221 at 20°C (liquid)
13.8 **Liquid Surface Tension.** 22.42 dynes/cm = 0.02242 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.52
13.11 **Ratio of Specific Heats of Vapor (Gas)** test 1.0073 at 20°C
13.12 **Latent Heat of Vaporization** 170.09 Btu/lb = 95.94 cal/g = 4.168 × 10⁵ J/kg
13.13 **Heat of Combustion** −17,600 Btu/lb = −9,780 cal/g = −409 × 10³ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** −170 Btu/lb = −93 cal/g = −3.9 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

NOTES

BUA tert-BUTYLAMINE

Common Synonyms	Liquid	Colorless	Ammonia-like odor
2 Aminoisobutane 2 Amino 2-methylpropane 1 1 Dimethylethylamine TBA Trimethylaminomethane	Floats and mixes with water. Flammable. Irritating vapor is produced.		

Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled, will cause difficult breathing LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Aminoisobutane
2-Amino-2-methylpropane
1,1-Dimethylethylamine, TBA
Trimethylaminomethane

3.2 **Coast Guard Compatibility Classification:** Aliphatic amine

3.3 **Chemical Formula:** $(CH_3)_3CNH_2$

3.4 **IMCO/United Nations Numerical Designation:** 32 1993

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like ammonia

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose, mouth, and lungs. Ingestion causes irritation of mouth and stomach. Contact with liquid causes severe irritation of eyes and moderate irritation of skin.

5.3 **Treatment for Exposure:** INHALATION: move to fresh air, give artificial respiration if breathing has stopped. INGESTION: give large amounts of water and induce vomiting. EYES: immediately flush with water for at least 15 min., get medical attention. SKIN: flush with water, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 480 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 10°F (-12°C)

6.2 **Flammable Limits in Air:** 1.7% - 8.9% (at 212°F)

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** 464°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 2.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Liquid will attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Monsanto Company
800 N. Lindbergh Blvd.
St. Louis, Mo. 63166
2. Eastman Organic Chemicals
Rochester, N.Y. 14650
3. Aldrich Chemical Co.
940 W. Saint Paul Avenue
Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A P Q R S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 73.14

13.3 **Boiling Point at 1 atm:** 113°F = 45°C = 318°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Data not available

13.6 **Critical Pressure:** Data not available

13.7 **Specific Gravity:** 0.696 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 19 dynes/cm = 0.019 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.53

13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13.12 **Latent Heat of Vaporization:** 167.0 Btu/lb = 92 x cal/g = 388 x 10^3 J/kg

13.13 **Heat of Combustion:** −17,600 Btu/lb = −9,790 cal/g = −410 x 10^3 J/kg

13.14 **Heat of Decomposition:**

13.15 **Heat of Solution:** 170 Btu/lb = 96 cal/g = 4.0 x 10^3 J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

BTN BUTYLENE

Common Synonyms
1 Butene

Liquefied compressed gas Colorless Fragrant gasoline-like odor

Floats and boils on water. Flammable, ignitable vapor cloud is produced.

Stop discharge if possible. Keep people away. Stay off [illegible] and downwind. Notify local health and pollution control agencies. Keep out of low areas. Ventilate closed spaces before entering. Do not touch spilled material. Use water spray to disperse vapors. Avoid runoff into storm sewers, ditches, or waterways. Dike for later disposal. Water spill: Dilute with water. Remove by physical methods such as pumping or absorption.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Stop flow of gas. [illegible]
Use water spray to keep fire exposed containers cool. [illegible]

Exposure

[illegible]

VAPOR
If inhaled, will cause dizziness and difficult breathing.
[illegible]

LIQUID
Will cause frostbite
[illegible]

Water Poilution

Not harmful to aquatic life
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook. CG 446-4)

Issue warning. High flammability.
Restrict access.
Evacuate area.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Butene
3 2 **Coast Guard Compatibility Classification:** Olefin
3 3 **Chemical Formula:** $CH_3CH_2CH{=}CH_2$
3 4 **IMCO, United Nations Numerical Designation:** 2.0 1012

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Compressed gas
4 2 **Color:** Colorless
4 3 **Odor:** Sweetish

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles, gloves, self contained breathing apparatus or organic canister
5 2 **Symptoms Following Exposure:** May act as a simple asphyxiant or slight anesthetic at high vapor concentrations. Vapor concentrations are not usually a hazard at room temperature except in enclosed spaces.
5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air and apply resuscitation. Call a doctor. EYES AND SKIN: flush with water for at least 15 minutes.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Not pertinent
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to the eyes and throat
5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly. May cause frostbite.
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent
6 2 **Flammable Limits in Air:** 1.6% - 10%
6 3 **Fire Extinguishing Agents:** Stop flow of gas
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Containers may explode in fire. Vapor is heavier than air and may travel long distance to a source of ignition and flash back.
6 7 **Ignition Temperature:** 725°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 3.8 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** None
8 2 **Waterfowl Toxicity:** None
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Air Products and Chemicals Inc.
Allentown, Pa. 18105
2 Gulf Oil Corp.
Gulf Oil Chemicals Co. Division
Pittsburgh, Pa. 15230
3 Petro-Tex Chemical Corp.
Houston, Texas 77017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Data not available
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook. CG 446-3)

A B C D E F G

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Gas
13 2 **Molecular Weight:** 56.10
13 3 **Boiling Point at 1 atm.** 20.7°F = -6.3°C = 266.9°K
3 4 **Freezing Point:** -301.6°F = -185.3°C = 90°K
13 5 **Critical Temperature:** 295.4°F = 146.4°C = 419.6°K
13 6 **Critical Pressure:** 584 psia = 39.7 atm = 4.02 MN/m²
13 7 **Specific Gravity:** 0.595 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 12.5 dynes/cm = 0.0125 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** test 168 dynes/cm = 0.068 N/m at 0°C
13 10 **Vapor (Gas) Specific Gravity:** 1.9
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.104
13 12 **Latent Heat of Vaporization:** 166 Btu/lb = 93 cal/g = 3.91 × 10⁵ J/kg
13 13 **Heat of Combustion:** -9,487 Btu/lb = -10,526 cal/g = -453.26 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5-A

NOTES

REVISED 1978

BTO BUTYLENE OXIDE

Common Synonyms
1,2 Butylene oxide
1,2 Epoxybutane
1 Butene oxide
Alpha-butylene oxide

Liquid | Colorless | Sharp odor

Mixes with water

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability; air contaminant
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Butene oxide
1,2 Butylene oxide *alpha* Butylene oxide 1,2 Epoxybutane

3 2 **Coast Guard Compatibility Classification.** Alkylene oxide

3 3 **Chemical Formula:** C_4H_8O or $CH_3CH_2CHCH_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Clean protective clothing, rubber gloves, chemical workers goggles, self contained breathing apparatus

5 2 **Symptoms Following Exposure** Inhalation of odorless odor and irritation, respiratory injury may occur at higher levels. Ingestion causes irritation of mouth and stomach. Contact with either liquid or vapor may cause burns of eyes. Liquid causes a painful type of skin burn if free to evaporate, if confined to skin, burn may cause skin sensitization. If readily absorbed in toxic amounts.

5 3 **Treatment for Exposure:** INHALATION: if any ill effects occur, immediately remove person to fresh air and get medical help; if breathing stops, start artificial respiration. INGESTION: induce vomiting promptly and get medical help. EYES: promptly flush with plenty of water for at least 15 min. and get medical help. SKIN: promptly flush with plenty of water, remove all contaminated clothing and wash before reuse.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1,410 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** < −20°F (C)

6 2 **Flammable Limits in Air:** 1.5% - 18.3%

6 3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:** Containers may explode in fire. Use water to cool containers from sheltered station.

6 7 **Ignition Temperature:** 959°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** May occur when in contact with strong acids or bases

7 6 **Inhibitor of Polymerization:** Data not available

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Dow Chemical U.S.A.
Midland, Mich. 48640

2 Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical 95%

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Pressure vent

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VPQRS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 72

13 3 **Boiling Point at 1 atm:** 145°F = 63°C = 336°K

13 4 **Freezing Point:** < −53°F = < −47°C = < 223°K

13 5 **Critical Temperature.** Data not available

13 6 **Critical Pressure:** Data not available

13 7 **Specific Gravity:** 0.826 at 25°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 2.49

13 11 **Ratio of Specific Heats of Vapor (Gas)** Data not available

13 12 **Latent Heat of Vaporization** (est.) 180 Btu/lb = 100 cal/g = 4.2 × 10⁵ J/kg

13 13 **Heat of Combustion:** −15,200 Btu/lb = −8,470 cal/g = −354 × 10⁵ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Data not available

(Continued on next page)

NOTES

BHP — tert-BUTYL HYDROPEROXIDE

Common Synonyms
Cadox TBH

Watery liquid | Colorless | Odorless

Floats and mixes slowly with water

Fire

FLAMMABLE.
May explode if subjected to heat, flame or shock.
May cause fire and explode on contact with combustibles.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

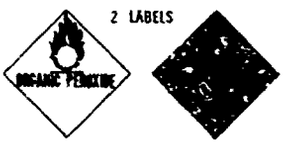
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 448-1)

Isolate warning, high flammability
Remove access
Mechanical containment
Chemical and physical treatment

2 LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cadox TBH
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula:** $(CH_3)_3COOH$
3.4 **IMCO/United Nations Numerical Designation:** UN 2093

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles, well fitting gloves, barrier cream
5.2 **Symptoms Following Exposure:** Data do not indicate severe burns of skin and eyes
5.3 **Treatment for Exposure:** INGESTION: induce vomiting and follow with gastric lavage. INHALATION: remove individual to fresh air, maintain oxygen, give artificial respiration and resuscitation if needed. SKIN, EYE AND MUCOUS MEMBRANE CONTACT: Flush affected tissues with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3, slightly toxic
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes slight smarting of the eyes, respiratory system in concentrations. Effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Powerful irritant to eyes and skin
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 100°F CC
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Dry chemical, foam or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** May explode in fire
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Keep vapor away from catalytic surfaces; this includes wood and some metals
7.3 **Stability During Transport:** Shock and heat sensitive; self accelerating decomposition at 200°F
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Pennwalt Corp.
   Tech. Chem. Dept.
   Buffalo, N.Y. 14240
2. Witco Chemical Corp.
   U.S. Peroxygen Division
   Marshall, Texas 75670

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 70% wt
10.2 **Storage Temperature:** 40°F
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-O-7

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	*
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammables (Red)	4
Reactivity (Yellow)	4

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 90.12
13.3 **Boiling Point at 1 atm.** Decomposes
13.4 **Freezing Point:** -41°F = 233°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.8 at 25°C (Liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension.** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** -12,400 Btu/lb = -6,900 cal/g = -289 × 10³ J/kg
13.14 **Heat of Decomposition.** -6,500 Btu/lb = -3,600 cal/g = -151 × 10³ J/kg
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

NOTES

REVISED 1978

BTM

n-BUTYL MERCAPTAN

Common Synonyms
1-Butanethiol
Thiobutyl alcohol

Liquid | Colorless to yellow | Skunk like odor

Floats on water. Poisonous vapor is produced.

Fire

FLAMMABLE
Irritating gases may be produced when heated
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

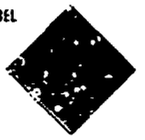
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability
Remove sources
Mechanical containment
Avoid bottom runoff
Chemical and biological treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms: 1-Butanethiol; Butyl mercaptan; Thiobutyl alcohol
3.2 Coast Guard Compatibility Classification: Not applicable
3.3 Chemical Formula: $CH_3(CH_2)_3SH$
3.4 IMCO/United Nations Numerical Designation: UN 2347

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless to yellow
4.3 Odor: Skunk like

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Plastic gloves; goggles; self-contained breathing apparatus
5.2 Symptoms Following Exposure: Inhalation of vapor irritates nose, throat, lungs and causes coughing and wheezing; may cause nausea, vomiting and headache; vapor irritates eyes, causes pain and excessive tearing; liquid irritates skin
5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; if not breathing, give artificial respiration; if breathing is difficult, give oxygen; keep victim warm and quiet; get medical attention. EYES: wash with plenty of water for at least 15 minutes; get medical attention. SKIN: wash with soap and water; remove contaminated clothing and wash before reuse. INGESTION: induce vomiting immediately as directed by medical personnel; never give anything by mouth to an unconscious person; get medical attention.
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 ppm
5.5 Short-Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 4; Rat LD_{50} 500 mg/kg
5.7 Late Toxicity: Data lacking
5.8 Vapor (Gas) Irritant Characteristics: Data lacking
5.9 Liquid or Solid Irritant Characteristics: Data lacking
5.10 Odor Threshold: 0.001 ppm

6 FIRE HAZARDS

6.1 Flash Point: 2°F TOC
6.2 Flammable Limits in Air: Data lacking
6.3 Fire Extinguishing Agents: Dry chemical; foam; carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water
6.5 Special Hazards of Combustion Products: Irritating sulfur oxides and fumes
6.6 Behavior in Fire: Vapor may travel to source of ignition and flash back; containers may explode in fire
6.7 Ignition Temperature: 347°F
6.8 Electrical Hazard: Data lacking
6.9 Burning Rate: Data lacking

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Rating 2; 96-Hr TLm: Fresh water
8.2 Waterfowl Toxicity: Data lacking
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Pennwalt Corporation
Industrial Chemicals Department
Three Parkway
Philadelphia, PA 19102

Phillips Petroleum Company
Chemicals Department
Special Products Division
Phillips Building
Bartlesville, Okla. 74004

Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 Grades of Purity: 95%
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: Nitrogen blanket
10.4 Venting: Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NFEW

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Flammable liquid
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 90.2
13.3 Boiling Point at 1 atm: 208.3°F = 98.0°C = 371°K
13.4 Freezing Point: -262°F = -165°C = 108°K
13.5 Critical Temperature: 554°F = 290°C = 563°K
13.6 Critical Pressure: 732 psia = 49.8 atm = 4.96 MN/m²
13.7 Specific Gravity: 0.841 at 20°C (liquid)
13.8 Liquid Surface Tension: 26.1 dynes/cm = 0.0261 N/m at 20°C
13.9 Liquid-Water Interfacial Tension: 36.6 dynes/cm = 0.0366 N/m at 20°C
13.10 Vapor (Gas) Specific Gravity: 3.1
13.11 Ratio of Specific Heats of Vapor (Gas): 1.0792
13.12 Latent Heat of Vaporization: 164 Btu/lb = 91.1 cal/g = 381 J/g
13.13 Heat of Combustion: -17,900 Btu/lb = -9,940 cal/g = -41,600 J/g
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

(Continued on page 3)

NOTES

BMN	n-BUTYL METHACRYLATE

Common Synonym			
Methacrylic acid, butyl ester Butyl methacrylate Butyl 2-methacrylate n-Butyl alpha-methylacrylate	Liquid	Colorless	Mild odor
	Floats on water		

Fire	Combustible Containers may explode in fire
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Mechanical containment
Should be removed
Chemical or physical treatment

2. LABELS

Non-flammable
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Methacrylic acid, butyl ester; Butyl methacrylate; Butyl 2-methacrylate; n-Butyl alpha-methylacrylate; Butyl 2-methyl-2-propenoate

3.2 **Coast Guard Compatibility Classification:** Acrylate

3.3 **Chemical Formula:** $CH_2=C(CH_3)CO_2CH_2CH_2CH_2CH_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Moderate acrylate

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Not normally required. Impervious gloves, chemical splash goggles

5.2 **Symptoms Following Exposure.** Irritation to eyes, nose and throat. Exposure to vapors may cause headache, dizziness, nausea and vomiting

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. EYES: flush with plenty of water for at least 15 minutes and call physician. SKIN: wash with soap and water. INGESTION: induce vomiting and call physician

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion.** Grade 1 (Practically non-toxic to rats)

5.7 **Late Toxicity:** Birth defects in rats, progeny and skeletal abnormalities

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 160°F OC

6.2 **Flammable Limits in Air:** Not determined

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** 562°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** May occur when heated

7.6 **Inhibitor of Polymerization.**
10 ppm hydroquinone
Hydroquinone
20 ppm hydroquinone

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Rohm and Haas Co.
Independence Mall West
Philadelphia, PA 19105

Plastics Department
306 Market St.
Wilmington, DE 19801

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99.5%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

A-3-I

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 142.2

13.3 **Boiling Point at 1 atm.**
298°F = 148°C = 421°K

13.4 **Freezing Point.**
-72°F = -58°C = 215°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.895 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (dynes/cm = ergs/cm² at 20°C)
30 dynes/cm = 0.030 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (dynes/cm = ergs/cm² at 20°C)
8 dynes/cm = 0.008 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** -4 x 10⁶ Btu/lb
= -9.3 x 10³ cal/g = -388 x 10⁶ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** -250 Btu/lb
= -139 cal/g = -582 x 10³ J/kg

Continued on next page

NOTES

BTP p-tert-BUTYLPHENOL

Common Synonyms	Solid White Disinfectant like odor May float or sink in water
Fire	Combustible
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing SOLID Will burn skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

Hazard label required by U.S. Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $C_4H_9C_6H_4OH$
3.4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** Aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical workers goggles clean body-covering clothing
5.2 **Symptoms Following Exposure:** Inhalation of vapors causes irritation of respiratory system. Ingestion causes irritation of mouth and stomach. Contact with eyes causes severe irritation. Contact with skin causes severe irritation but not usually to a degree to prevent work. Prolonged contact may cause moderate irritation even a mild burn.
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. If not breathing, begin artificial respiration. If breathing has ceased. INGESTION: force milk or water and induce vomiting. Treat symptomatically. EYES: irrigate with flowing water for at least 15 minutes. Get medical attention promptly. SKIN: flush with plenty of water. Remove grossly contaminated clothing.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion.** Grade 2 rat LD_{50} 2.5 g/kg (oral)
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 250°F (C.C. (Cleveland))
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents.** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective
6.5 **Special Hazards of Combustion Products.**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature** Not pertinent
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. The Dow Chemical Co.
2030 Dow Center
Midland, Mich. 48640
2. Address Chemical Co.
980 W. Saint Paul Ave.
Milwaukee, Wis. 53233
3. Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 98.5%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 150
13.3 **Boiling Point at 1 atm:**
463°F = 239.4°C = 512.5°K
13.4 **Freezing Point:**
210°F = 99°C = 372°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.05 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent
13.12 **Latent Heat of Vaporization.**
Not pertinent
13.13 **Heat of Combustion:** (solid)
-16,900 Btu lb^{-1} = -9.8 x 10^{6} J kg^{-1}
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on next page)

NOTES

BCS — BUTYLTRICHLOROSILANE

Common Synonyms	Liquid	Colorless	Sharp, irritating odor
n-Butyltrichlorosilane	Reacts violently with water. Irritating visible vapor cloud is produced.		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.

Fire

Combustible.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
DO NOT USE WATER ON FIRE.

Exposure

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Initial Isolation: Immediate
Restrict Access
Dispersal Water

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Butyltrichlorosilane
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $C_4H_9HCl_3Si$
3.4 **IMCO/United Nations Numerical Designation:** 1747

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sharp, irritating odor at low concentrations

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Avoid vapor. Use respiratory protection while entering area. Wear rubber gloves, goggles and other protective equipment as necessary to prevent skin and eye contact.

5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates eyes, upper respiratory system. Contact of liquid with eyes or skin causes severe burns. Ingestion causes burns of mouth and throat.

5.3 **Treatment for Exposure:** Seek medical attention if ill effects are experienced. Keep victim quiet. INHALATION: remove to fresh air; apply artificial respiration if not breathing. EYES: Flush with water for 15 minutes. SKIN: Flush with water. INGESTION: DO NOT induce vomiting. Give large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 180°F (82°C) C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6.5 **Special Hazards of Combustion Products:** Hydrogen chloride, silicon oxides, carbon monoxide
6.6 **Behavior in Fire:** Decomposes on heating. Reacts with metal.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Not applicable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to generate hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials:** Will react with common metals to produce hydrogen chloride and cause severe corrosion
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, then with sodium bicarbonate or lime slurry
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Corning Corporation
P.O. Box 994
Midland, Michigan 48640

Petrarch Systems, A Division of
PCR Inc.
Gainesville, Florida 32601

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 96%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Nitrogen recommended
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NO

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 219.6
13.3 **Boiling Point at 1 atm:** 208°F = 42°C = 315°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.08 at 20°C/4°C (liquid)
13.8 **Liquid Surface Tension:** 25.3 dynes/cm = 0.0253 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 6.8
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 125 Btu/lb = 69.5 cal/g = 2.91 x 10^5 J/kg
13.13 **Heat of Combustion:** -3,920 Btu/lb = -2,180 cal/g = 9.13 x 10^6 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

CTD

1,4-BUTYNEDIOL

Common Synonyms
2-Butyne-1,4-diol
4-Dihydroxy-2-butyne

Solid crystals or watery solution. Solid is white to light yellow. Solution is brownish yellow.

Sinks and mixes with water

Stop discharge if possible
Call fire department
Avoid contact with liquid and solid
Isolate and keep discharged material out of water
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with water, alcohol foam, dry chemical or carbon dioxide

Exposure

CALL FOR MEDICAL AID
LIQUID OR SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Wash affected areas with plenty of water
IF IN EYES: hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and pollution control officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
2-Butyne-1,4-diol
1,4-Dihydroxy-2-butyne

3.2 **Coast Guard Compatibility Classification:**
Not applicable

3.3 **Chemical Formula:**
$HOCH_2{-}C{\equiv}C{-}CH_2OH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or 35% aqueous solution

4.2 **Color:** Solid: colorless to pale yellow. Solution: straw to amber color

4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Neoprene rubber gloves and safety goggles or face shield

5.2 **Symptoms Following Exposure.** May cause dermatitis

5.3 **Treatment for Exposure:** SKIN CONTACT: wash affected skin area thoroughly with water. EYE CONTACT: immediately wash with water for at least 15 minutes and get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits.** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 3. LD$_{50}$ to 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 263°F O.C. (pure butynediol)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Water, alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

GAF Corporation
Chemical Division
Calvert City, Kentucky 42029

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Tech. Flake 96+
35% solution

10.2 **Storage Temperature.** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 86.09

13.3 **Boiling Point at 1 atm.** 460°F = 238°C = 511°K

13.4 **Freezing Point:** 140°F = 58°C = 331°K

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 1.07 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −11,020 Btu/lb = −6120 cal/g = -256.2×10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

BAD — iso-BUTYRALDEHYDE

Common Synonyms
2-Methylpropanal
Isobutyric aldehyde
Isobutyraldehyde
Isobutylaldehyde

Watery liquid | Colorless | Pleasant gasoline-like odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, CO2, water spray or foam.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin.
Will burn eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - high flammability.
Restrict access.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Isobutyraldehyde
Isobutyraldehyde
Isobutylaldehyde
2-Methylpropanal

3.2 **Coast Guard Compatibility Classification:**
Aldehyde

3.3 **Chemical Formula:** $(CH_3)_2CHCHO$

3.4 **IMCO/United Nations Numerical Designation:** 3.2 2045

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Appropriate protective clothing including rubber gloves, rubber shoes and protective eyewear.

5.2 **Symptoms Following Exposure:** Vapor is irritating to the eyes and mucous membranes.

5.3 **Treatment for Exposure:** If IN EYES, immediately flush with plenty of water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available.

5.5 **Short-Term Inhalation Limits:** Data not available.

5.6 **Toxicity by Ingestion:** Grade 2, 0.5 to 5 g/kg (rat).

5.7 **Late Toxicity:** Data not available.

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.047 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 13°F O.C. = -40°F C.C.

6.2 **Flammable Limits in Air:**
2.0% - 10.0%

6.3 **Fire Extinguishing Agents.** Foam, dry chemical or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:**
Data not available.

6.5 **Special Hazards of Combustion Products:**
Not pertinent.

6.6 **Behavior in Fire:** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back. Fires are difficult to control due to ease of reignition.

6.7 **Ignition Temperature:** 365°F

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** 4.8 mm/min.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.

7.2 **Reactivity with Common Materials:**
No reaction.

7.3 **Stability During Transport:** Stable.

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization.** Not pertinent.

7.6 **Inhibitor of Polymerization:**
Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity.**
Data not available.

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD)**
162 lb/lb in 5 days.

8.4 **Food Chain Concentration Potential**
None.

9 SELECTED MANUFACTURERS

1. Dow Badische Co.
Williamsburg, Va. 23185

2. Eastman Kodak Co.
Texas Eastman Co. Division
Longview, Texas 75601

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Dry grade 98.0%, wet grade 96.0%, commercial 9[illegible]%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement.

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazardous Assessment Handbook, CG-446-3)

A-P-Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 72.11

13.3 **Boiling Point at 1 atm:**
147°F = 64.1°C = 337.3°K

13.4 **Freezing Point:**
-112°F = -80°C = 193°K

13.5 **Critical Temperature:**
464°F = 240°C = 513°K

13.6 **Critical Pressure:**
600 psia = 41 atm = 4.2 MN/m

13.7 **Specific Gravity:** 0.791 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
22.0 dynes/cm = 0.0220 N/m at 24°C

13.9 **Liquid-Water Interfacial Tension:**
7.2 dynes/cm = 0.0072 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** 2.5

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.093

13.12 **Latent Heat of Vaporization:**
180 Btu/lb = 98 cal/g = 4.1 × 10⁵ J/kg

13.13 **Heat of Combustion:** -13,850 Btu/lb = -7693 cal/g = -322.1 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent.

13.15 **Heat of Solution:** Not pertinent.

13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

REVISED 1978

BTR	# n-BUTYRALDEHYDE

Common Synonyms
Butyraldehyde
Butaldehyde
Butyric aldehyde
Butanal
Butylaldehyde

Watery liquid | Colorless | Pungent odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache or loss of consciousness.

LIQUID
Irritating to skin.
Will burn eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: highly flammable
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Butanal
Butyraldehyde
Butyric aldehyde
Butylaldehyde

3 2 **Coast Guard Compatibility Classification:**
Aldehyde

3 3 **Chemical Formula:**
$CH_3CH_2CH_2CHO$

3 4 **IMCO/United Nations Numerical Designation:** 12 1129

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent aldehyde, pungent and intense

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective goggles, gloves and organic canister gas mask

5 2 **Symptoms Following Exposure:** Inhalation will cause irritation and possible nausea, vomiting, headache and loss of consciousness. Contact with eyes causes burns. Skin contact may be irritating.

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if breathing has stopped, give artificial respiration; if breathing is difficult, give oxygen; call a doctor at once. SKIN AND EYES: immediately flush with water for at least 15 min.; get medical care for eyes; remove contaminated clothing and wash underlying skin.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1; 5.15 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** 0.0046 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 15°F O.C., 20°F C.C.

6 2 **Flammable Limits in Air:**
2.5% - 10.6%

6 3 **Fire Extinguishing Agents:**
Dry chemical, carbon dioxide, foam

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Not pertinent

6 6 **Behavior in Fire:** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back. Fires are difficult to control due to ease of reignition.

6 7 **Ignition Temperature:** 446°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 4.4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** None

7 2 **Reactivity with Common Materials:**
None

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** May occur in presence of heat, acids or alkalis

7 6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):**
1.62 lb/lb, 5 days, 100% (theor.)

8 4 **Food Chain Concentration Potential:**
Data not available

9 SELECTED MANUFACTURERS

1 Dow Badische Co
Williamsburg, VA 23185

2 Eastman Kodak Co
Texas Eastman Division
Longview, Texas 75601

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:**
Water saturated 97% dry 99.5%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P-Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Liquid

13 2 **Molecular Weight:** 72.11

13 3 **Boiling Point at 1 atm:**
167°F = 74.8°C = 348.0°K

13 4 **Freezing Point:**
−142°F = −96.4°C = 176.8°K

13 5 **Critical Temperature:**
488°F = 253°C = 526°K

13 6 **Critical Pressure:**
590 psia = 40 atm = 4.1 MN/m²

13 7 **Specific Gravity:** 0.803 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
24.6 dynes/cm = 0.0246 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:**
5.7 dynes/cm = 0.0057 N/m at 22.3°C

13 10 **Vapor (Gas) Specific Gravity:** 2.5

13 11 **Ratio of Specific Heats of Vapor (Gas):**
1.089

13 12 **Latent Heat of Vaporization**
194 Btu/lb = 102 cal/g = 4.27 × 10⁵ J/kg

13 13 **Heat of Combustion:** −15,200 Btu/lb = −8450 cal/g = −353.8 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

BRA

n-BUTYRIC ACID

Common Synonyms

Butanic acid
Butanoic acid
Ethylacetic acid
Propanecarboxylic acid
Butyric acid

Liquid Colorless Rancid butter odor

Floats and mixes with water
Freezing point is 23°F

[illegible]

Fire

Combustible

[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.

[illegible]

LIQUID
Will burn skin and eyes.
If swallowed will cause nausea and vomiting

[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4

Issue warning water contaminant
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Butanic acid Butanoic acid Butyric acid Ethylacetic acid Propanecarboxylic acid

3.2 **Coast Guard Compatibility Classification:** Organic acid

3.3 **Chemical Formula:** $CH_3CH_2CH_2COOH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Clear

4.3 **Odor:** Rancid disagreeable strong penetrating like rancid butter

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus rubber gloves vapor proof plastic goggles impervious apron and boots

5.2 **Symptoms Following Exposure.** Inhalation causes irritation of mucous membrane and respiratory tract may cause nausea and vomiting Ingestion causes irritation of mouth and stomach Contact with eyes may cause serious injury Contact with skin may cause burns chemical is readily absorbed through the skin and may cause damage by this route

5.3 **Treatment for Exposure:** INHALATION remove victim to fresh air give oxygen if breathing is difficult call a physician INGESTION give large amount of water and induce vomiting EYES irrigate with water for 15 min and get medical attention SKIN flush affected areas immediately and thoroughly with water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion** Grade 2 oral LD_{50} [illegible]

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Vapor [illegible] storage temperatures such that vapors will find high concentrations unpleasant [illegible] temperatures

5.9 **Liquid or Solid Irritant Characteristics** [illegible] severe irritant May cause pain and severe degree burns after a few minutes [illegible]

5.10 **Odor Threshold.** 0.001* ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 166°F (C.C.) 160°F (C.C.)

6.2 **Flammable Limits in Air:** 2.0% - 10.0%

6.3 **Fire Extinguishing Agents.** Dry chemical alcohol foam carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used*** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire*:**

6.7 **Ignition Temperature:** 842°F

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate** 2.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May attack aluminum or other light metals with formation of flammable hydrogen gas

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
400 ppm* trout lethal/fresh water
200 ppm 24 hr bluegill TL_m fresh water
*Time period not specified

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)*:**
1.150 lb/lb 5 days 1.480 lb/lb 20 days

8.4 **Food Chain Concentration Potential:** Seafood may be tainted following a spill but chemical does not concentrate in food chain

9. SELECTED MANUFACTURERS

1 Celanese Chemical Co
522 Fifth Avenue
New York N Y 10036

2 Eastman Chemical Products Inc
Kingsport Tenn 37662

3 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 384
Jersey City N J 07303

10. SHIPPING INFORMATION

10.1 **Grades or Purity** Commercial 99.5+%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Corrosive Material

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm**
Liquid

13.2 **Molecular Weight:** 88.1

13.3 **Boiling Point at 1 atm:**
327°F = 164°C = 437°K

13.4 **Freezing Point** 23°F = -5°C = 268°K

13.5 **Critical Temperature:**
673°F = 356°C = 629°K

13.6 **Critical Pressure**
764 psia = 52 atm = 5.3 MN/m

13.7 **Specific Gravity:** 0.958 at 20°C

13.8 **Liquid Surface Tension:**
26.74 dynes/cm = 0.02674 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 3.0

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.079 at 20°C

13.12 **Latent Heat of Vaporization:** 187 Btu/lb
= 92.7 cal/g = 388 × 10³ J/kg

13.13 **Heat of Combustion:** -10,620 Btu/lb
= -5,900 cal/g = -247 × 10³ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** -87 Btu/lb
= -48 cal/g = -2.0 × 10³ J/kg

13.16 **Heat of Polymerization** Not pertinent

[illegible]

NOTES

CDA CACODYLIC ACID

Common Synonyms
Hydroxydimethylarsine oxide
Dimethylarsinic acid
ANSAR
Silvisar 510

Solid Colorless or dyed blue

Sinks and mixes with water

AVOID CONTACT WITH BLOOD AND SKIN
KEEP AWAY

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Hydroxydimethylarsine oxide, Dimethylarsinic acid, Ansar, Silvisar 510
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula** $(CH_3)_2AsOOH$
3 4 **IMCO/United Nations Numerical Designation:** 6.1/1572

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White; water solutions may be dyed blue
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator, goggles, protective clothing
5 2 **Symptoms Following Exposure:** Chemical is essentially not irritating in contact with skin or eyes. Ingestion causes arsenic poisoning, but symptoms are delayed.
5 3 **Treatment for Exposure:** Be alert for delayed arsenic poisoning symptoms. EYES or SKIN: flush with water. INGESTION: induce vomiting and call physician at once.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2; oral rat LD_{50} = 700 mg/kg
5 7 **Late Toxicity:** Arsenic poisoning
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** May form toxic oxides of arsenic when heated
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 100 ppm/96 hr/sea/not toxic
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

The Ansul Company
Chemical Division
1 Stanton Street
Marinette, Wis. 54143

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 50% solution in water, dyed blue
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NN

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 138
13 3 **Boiling Point at 1 atm:** >392°F = >200°C = >473 K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** (est.) = -6100 Btu/lb = -3390 cal/g = -140 × 10^3 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** (est.) = 54 Btu/lb = 30 cal/g = 1 × 10^3 J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CAT

CADMIUM ACETATE

Common Synonyms
Cadmium acetate dihydrate

Solid | Colorless | Odorless

Sinks and mixes with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

DUST
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing.

SOLID
POISONOUS IF SWALLOWED

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cadmium acetate dihydrate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Cd(C_2H_3O_2)_2 \cdot 2H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation causes coughing, sneezing, symptoms of lung damage. Ingestion produces severe toxic symptoms, both kidney and liver injuries may occur. Contact with dust causes eye irritation
5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, seek medical attention. INGESTION: induce vomiting, allay gastrointestinal irritation by swallowing milk or egg whites at frequent intervals, perform gastric lavage, seek medical attention. EYES: flush with water for at least 15 min.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ as cadmium
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4 LD_{50} < 50 mg/kg
5 7 **Late Toxicity:** Delayed liver, lung and kidney damage has followed respiratory exposures to cadmium salts in industry
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fumes may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** Concentrated by shellfish

9 SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 - 206 North
Somerville, N J 08876

2 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 384
Jersey City, N J 07303

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure 99% Reagent
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 266.52
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.34 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CMB — CADMIUM BROMIDE

Common Synonyms	Solid	White	Odorless
Cadmium bromide tetrahydrate	Mixes with water		

AVOID CONTACT WITH SKIN AND CLOTHING KEEP FROM ANY CONTACT WITH WATER

Wear dust respirator and face shield or goggles and rubber gloves

Isolate leaking containers

Notify local health and pollution control agencies

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE

Keep upwind of fire

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing.

Remove contaminated clothing
Flush affected areas with plenty of water
IF IN EYES Lift upper and lower lids and flush with plenty of water
IF SWALLOWED induce VOMITING by giving milk or egg whites
IF SWALLOWED give LARGE QUANTITIES OF WATER

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
If swallowed will cause nausea, vomiting and loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cadmium bromide tetrahydrate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $CdBr_2 \cdot 4H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation causes coughing, sneezing, symptoms of lung damage. Ingestion produces severe toxic symptoms, both kidney and liver injuries may occur. Contact with eyes causes irritation.
5 3 **Treatment for Exposure:** INHALATION remove patient to fresh air, seek medical attention. INGESTION induce vomiting, allay GI irritation by giving milk or egg whites at frequent intervals, perform gastric lavage, seek medical attention. EYES flush with water for at least 15 min.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg m³ as cadmium
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4 $LD_{50} < 50$ mg kg
5 7 **Late Toxicity:** Delayed liver, kidney and lung damage has followed respiratory exposure to cadmium salts in industry
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fumes may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Concentrated by shellfish

9. SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 206 North
Somerville N J 08876

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

3 Research Organic Inorganic Chemical Corp
Sun Valley Calif 91352

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99.5% Anhydrous 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 344.27
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** > 1 1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:**
-2.3 Btu/lb = -1.3 cal g
= -0.054×10^3 J kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 0 0 A

NOTES

CDC

CADMIUM CHLORIDE

Common Synonyms	Solid crystals	White	Odorless
	Sinks and mixes with water		

[illegible] and remove the hazardous material
[illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

SOLID
Harmful if swallowed
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. Induce vomiting. Get medical attention.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate water for contaminant
Should be removed

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** CdCl
3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Crystalline solid
4 2 **Color:** White
4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses, rubber gloves, and respirator with proper filter.
5 2 **Symptoms Following Exposure:** Ingestion causes gastroenteritis, distress, pain and prostration. Severe disturbances, liver injury, and convulsions have been observed in severe intoxications.
5 3 **Treatment for Exposure:** INGESTION: induce vomiting and follow with gastric lavage, a saline cathartic, and demulcents. Consider use of a chelating agent, such as EDTA. BAL has been found effective in several exposed animals and in a few humans. BAL has been found effectively effective in animal experiments to justify its use in human intoxication. Since the BAL-cadmium complex has a nephrotoxic action, the physician will have to decide whether or not to use the drug.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 4 LD_{50} below 50 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
5 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** [illegible] ppm/96 hr/bluegill/TL$_m$/fresh water
8 2 **Waterfowl Toxicity:** LC_{50} >5000 ppm
8 3 **Biological Oxygen Demand (BOD):** Not pertinent
8 4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Division
Morristown, NJ 07960

2 Chemetron Corp
Inorganic Chemicals Division
Cleveland, Ohio 44113

3 Mallinckrodt Chemical Work
Industrial Chemicals Division
St. Louis, Mo 63160

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature:** Data not available
10 3 **Inert Atmosphere:** Data not available
10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poison, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 228.35
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 4.05 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on next page)

NOTES

REVISED 1978

CFB CADMIUM FLUOROBORATE

Common Synonyms
Cadmium fluoborate
Cadmium fluoborate solution

Liquid | Colorless | Odorless

Sinks and mixes with water

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles and self-contained breathing apparatus.
[illegible]
In case of contact immediately flush skin or eyes with plenty of water for at least 15 minutes.
Remove and isolate contaminated clothing and shoes.

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.
VAPOR
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing.
In case of contact immediately flush skin or eyes with plenty of water for at least 15 minutes.
Remove and isolate contaminated clothing and shoes.
If breathing has stopped give artificial respiration.
If breathing is difficult give oxygen.
LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
In case of contact immediately flush skin or eyes with plenty of water for at least 15 minutes.
Remove and isolate contaminated clothing and shoes.
IN EYES hold eyelids open and flush with a steady gentle stream of water.
If SWALLOWED and victim is CONSCIOUS give large quantities of water.
Induce vomiting by touching back of throat with finger.
If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting or give anything by mouth.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4.

Issue warning. Water contaminated.
Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cadmium fluoborate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $Cd(BF_4)_2 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves and apron; safety glasses and face shield.
5.2 **Symptoms Following Exposure:** Ingestion produces severe toxic symptoms; both kidneys and liver injuries may occur; may be fatal. Contact with eyes or skin causes irritation.
5.3 **Treatment for Exposure:** INHALATION: remove patient to fresh air; seek medical attention. INGESTION: call a physician at once; if victim is conscious, induce vomiting by giving a table spoon of salt in a glass of warm water and repeat until vomit is clear; give milk or whites of eggs beaten with water; keep patient warm and quiet. EYES: flush with plenty of water and get medical attention. SKIN: flush with plenty of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ as cadmium
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 LD$_{50}$ 250 mg/kg (rat)
5.7 **Late Toxicity:** Delayed liver, kidney, and lung damage has followed respiratory exposure to cadmium salts or solutions.
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic hydrogen fluoride and cadmium oxide fumes may form in fires.
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Concentrated by shellfish

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
P O Box 1057R
Morristown N Y 07960

2 The Harshaw Chemical Co
1945 E 97 St
Cleveland Ohio 44106

3 Gallard-Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial 50% solution in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

C,P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 286 (calculated)
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.60 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 with 5

NOTES

CMN CADMIUM NITRATE

Common Synonyms
Cadmium nitrate tetrahydrate

Solid | White | Odorless

Sinks in water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

DUST
POISONOUS IF INHALED
If inhaled will cause headache, coughing, or difficult breathing.

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Toxic warning - water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cadmium nitrate tetrahydrate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Cd(NO_3)_2 \cdot 4H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, safety goggles, dust mask
5 2 **Symptoms Following Exposure:** Inhalation of fumes can produce coughing, chest constriction, pain, headache, nausea, vomiting, pneumonitis. Chronic poisoning is characterized by emphysema and kidney injury. Ingestion causes gastrointestinal disturbance and severe toxic symptoms. Both kidney and liver injuries may occur. Contact with eyes causes irritation.
5 3 **Treatment for Exposure:** INHALATION: remove patient to fresh air, seek medical attention. INGESTION: give large amounts of water and induce vomiting; give milk or egg whites, seek medical attention. EYES: flush with copious amounts of water for 15 min., consult a physician. SKIN: wash with soap and water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ as cadmium
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3, oral mouse LD_{50} = 100 mg/kg
5 7 **Late Toxicity:** Diffused liver, lung, and kidney damage has followed repeated exposures to cadmium salts in industry.
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and cadmium oxide fume may form in fires
6 6 **Behavior in Fire:** Will increase intensity of fire when in contact with combustible material
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Mixtures with wood or other combustibles may catch fire
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.06 ppm* ** guppy LD_{50} fresh water
0.2 ppm 10 days stickleback, salted fresh water
*As cadmium
**Time period not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Shellfish concentrate 900 - 1600 times

9. SELECTED MANUFACTURERS

1 The Harshaw Chemical Co
1945 E 97th Street
Cleveland, Ohio 44106

2 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 384
Jersey City, N J 07303

3 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown, N J 07960

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

NS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 428.4
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** 135°F = 57°C = 330 K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.45 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** -9.7 Btu/lb = 16.5 cal/g = 0.691 × 10⁵ J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

COX — CADMIUM OXIDE

Common Synonyms
Cadmium fume

Solid | Yellow brown | Odorless

Sinks in water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

DUST
POISONOUS IF INHALED
If inhaled will cause coughing.

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 448-1

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cadmium fume
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** CdO
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Yellow brown to brown
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirator approved for metal fumes, goggles, rubber gloves

5 2 **Symptoms Following Exposure:** Acute exposure to cadmium oxide fumes can cause severe or fatal lung irritation. Chronic poisoning is characterized by lung tumors, emphysema and kidney dysfunction. Ingestion produces severe toxic effects. Both kidney and liver injuries may occur. Contact with eyes causes irritation.

5 3 **Treatment for Exposure:** INHALATION: If there has been known exposure to dense cadmium oxide fume or cough, chest tightness or respiratory distress occur after possible exposure, place patient at bed rest and call a physician. INGESTION: induce vomiting, stop irritation by giving milk or egg whites if request is made, perform gastric lavage, seek medical attention. EYES: Flush with water for at least 15 min.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³

5 5 **Short-Term Inhalation Limits:** 0.1 mg/m³ for 30 min

5 6 **Toxicity by Ingestion:** Grade 3 [illegible] LD_{50} = 72 mg/kg

5 7 **Late Toxicity:** Delayed liver, lung and kidney damage has followed respiratory exposure to cadmium oxide in animals

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fume may form in fires.
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Concentrated by shellfish

9. SELECTED MANUFACTURERS

1 American Smelting and Refining Co
120 Broadway
New York, N.Y. 10005

2 J.T. Baker Chemical Co
Phillipsburg, N.J. 08865

3 Van Waters and Rogers
[illegible] South Broad St
Elizabeth, N.J. 07202

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Reagent, technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 448-3

H

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 128.4
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 6.95 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

CMS

CADMIUM SULFATE

Common synonyms

Solid White Odorless

Sinks and mixes slowly with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

DUST
POISONOUS IF INHALED
If inhaled will cause headache, coughing, or difficult breathing

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $CdSO_4$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber MSHA approved respirator, rubber gloves, safety goggles
5.2 **Symptoms Following Exposure:** Inhalation may cause dryness of throat, coughing, constriction in chest and headache. Ingestion may cause salivation, vomiting, abdominal pains or diarrhea. Contact with eyes causes irritation.
5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure and consult a physician. INGESTION: induce vomiting, then allay irritation with milk or egg whites given at frequent intervals; perform gastric lavage; seek medical attention. EYES: flush with water for at least 10 min.; consult a physician. SKIN: wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ as cadmium
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Oral rat LD_{50}: 88 mg/kg
5.7 **Late Toxicity:** Delayed lung, kidney, and testicular damage has followed respiratory exposure to cadmium salts in industry.
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fume may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** (48) ppm * fish LC in fresh water
*Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Not applicable
8.4 **Food Chain Concentration Potential:** Shellfish concentrate cadmium; fish do not

9 SELECTED MANUFACTURERS

The Harshaw Chemical Co.
1945 E. 97th Street
Cleveland, Ohio 44106

2 Mallinckrodt Chemical Works
223 Westside Avenue
P.O. Box 164
Jersey City, N.J. 07304

3 J.T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical
A.C.S. Hydrate grade, Reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NX

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 208.46
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 4.7 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -92.4 Btu/lb
-3.85 kcal/g-mole = -2.15 x 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on next Card

NOTES

CCA

CALCIUM ARSENATE

Common Synonyms
Tricalcium arsenate
Tricalcium ortho arsenate
Cucumber dust

Solid | White | Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear protective clothing
Notify authorities if exposed
Isolate spill or leak area immediately
Keep unauthorized personnel away

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear oxygen mask & full protective clothing

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED.
If inhaled will cause coughing or difficult breathing.
Prevent dust cloud. Isolate hazard area. Keep unnecessary people away. Don't get water on material. Avoid breathing dust. Keep upwind.

SOLID
POISONOUS IF SWALLOWED
If swallowed will cause nausea and vomiting.
Remove victim immediately to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
IN EYES hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim CONSCIOUS, induce vomiting immediately by giving one tablespoonful of salt in a glass of warm water. Repeat until vomit is clear. Then give 2 tablespoonfuls of Epsom salts or a glass of milk of magnesia. Stop vomiting. Call a physician.
IF SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting. Call physician immediately. Keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning - poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cucumber dust
Tricalcium arsenate
Tricalcium orthoarsenate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Ca_3(AsO_4)_2$

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1553

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation causes respiratory irritation. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give victim one tablespoonful of salt in glass of water, repeat until vomit is clear, then give 2 tablespoonfuls of Epsom salts or milk of magnesia and force fluids; call a physician in all cases of suspected poisoning. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, oral rat LD_{50} = 20 mg/kg

5 7 **Late Toxicity:** Arsenic compounds may cause skin and lung cancer

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic arsenic fume may be formed in fires

5 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
1 1 ppm/48 hr/perch/toxic/fresh water
4 3 ppm, 264 hr/crabs/toxic/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Possible bioaccumulation problem

9 SELECTED MANUFACTURERS

1 Los Angeles Chemical Co
4545 Ardine Street
South Gate, Calif 90280

2 Pfaltz and Bauer, Inc
126-04 Northern Blvd
Flushing, N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 70% containing calcium carbonate and calcium hydroxide (limestone and slaked lime)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 398

13 3 **Boiling Point at 1 atm.:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 3.62 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6

NOTES

CCP

CALCIUM CARBIDE

Common Synonyms			
Carbide Acetylenogen	Solid granules	Grey to blush black	Garlic odor
	Sinks in water, and bubbles appear on surface as flammable gas is produced		

[illegible]

Fire

Not flammable
FLAMMABLE, EXPLOSIVE GAS IS PRODUCED ON CONTACT WITH WATER
[illegible]
DO NOT USE WATER OR FOAM IN A CONFINED AREA

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
[illegible]
[illegible]
IN CASE OF CONTACT [illegible]

Water Pollution

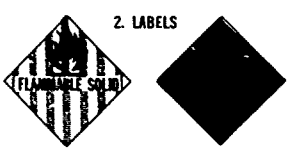
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Should be removed
Chemical and physical treatment

2. LABELS



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Acetylenogen
Carbide

3 2 **Coast Guard Compatibility Classification:**
Not applicable

3 3 **Chemical Formula:** CaC_2

3 4 **IMCO/United Nations Numerical Designation:** 4 3/1402

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Gray to blush black

4 3 **Odor:** Garlic like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical safety goggles and (for those exposed to unusually dusty operations) a respirator such as those approved by the U S Bureau of Mines for nuisance dusts

5 2 **Symptoms Following Exposure:** Eye and skin irritation

5 3 **Treatment for Exposure:** INHALATION OF DUST remove from further exposure and call a doctor SKIN wash with plenty of water EYES flush with clean running water at an eye wash fountain for at least 15 min and get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** None

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Dry powder preferably allow fire to burn

6 4 **Fire Extinguishing Agents Not to be Used:** Water vaporizing liquid or foam carbon dioxide

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** If wet by water highly flammable acetylene gas is formed

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously with water to form the highly flammable acetylene gas which may ignite spontaneously

7 2 **Reactivity with Common Materials:** Reacts with copper and brass to form explosive compound

7 3 **Stability During Transport:** Stable in absence of moisture

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Not pertinent

8 2 **Waterfowl Toxicity:** Not pertinent

8 3 **Biological Oxygen Demand (BOD):** Not pertinent

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Airco Inc
Airco Alloys and Carbide Div
3801 Highland Ave
Niagara Falls N Y 14305

2 Midwest Carbide Corp
Keokuk Iowa 52632

3 Union Carbide Corp
Chemicals and Plastics Div
270 Park Ave
New York N Y 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

RR-C

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Flammable Solid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	2
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 64 10

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2 22 at 18°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

CCC

CALCIUM CHLORATE

Common Synonyms

Solid | White | Odorless

Sinks and mixes with water

Calcium hypochlorite
Keeps fish wet
Prevents scaling, flocking of mud etc.
Kills catfish and pollutes recreational waters

Fire

Not flammable.
May explode on contact with combustibles
Irritating gases may be produced when heated
Combat fires from safe distance, cool containers
Flood discharge area with water

Exposure

Call for medical aid

DUST

Irritating to eyes, nose and throat
Move victim to fresh air
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim vomit
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting or give anything by mouth

SOLID

Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim vomit
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting or give anything by mouth

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning: oxidizing material
water contaminant
Should be removed
Chemical and physical treatment
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** $Ca(ClO_3)_2$
3 4 **IMCO/United Nations Numerical Designation.** 1451/1452

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, dust respirator, coveralls or other protective clothing
5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of upper respiratory system. Dust irritates eyes and skin. Ingestion causes abdominal pain, nausea, vomiting, diarrhea, pallor, shortness of breath, unconsciousness
5 3 **Treatment for Exposure** INHALATION: remove to fresh air. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: induce vomiting and get medical attention
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Grade 2, oral LD_{50} = 4 500 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable but may cause fire with other materials
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents.** Flood with water
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire:** When involved in a fire may cause an explosion. Irritating gases may be generated when heated
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May form an explosive mixture with finely divided combustible material. The mixture may ignite when rubbed
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Ceras Inc
Menomonee Falls, Wis 53051
2 Gallard Schlesinger Chemical Manufacturing Corp
584 Mineola Ave
Carle Place, N Y 11514
3 Dynamit Nobel AG
105 Stonehurst Court
Northvale, N J 07647

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
May be shipped as dihydrate
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 444-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight.** 207
13 3 **Boiling Point at 1 atm** Decomposes
13 4 **Freezing Point** 644 F = 340°C = 613 K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity** 2.710 at 0°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** (est.) = 54 Btu/lb = = 30 cal/g = = 1.3 × 10 J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CLC

CALCIUM CHLORIDE

Common Synonyms
Calcium chloride, anhydrous
Calcium chloride hydrates

Solid or water solution | White to off-white | Odorless

Sinks and mixes with water

Avoid contact with liquid and solid. Keep people away.
Wear protective clothing, including gloves.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and other officials as required.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
SOLUTION OR SOLID
Will burn skin and eyes.
If swallowed will cause nausea and vomiting.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give liquid. Keep victim warm.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Calcium chloride anhydrous, Calcium chloride hydrates
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $CaCl_2 \cdot xH_2O$ where x = 0 to 6
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or water solution
4 2 **Color:** White to off white
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses or face shield, dust type respirator, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes (particularly by dust) causes irritation and possible transient corneal injury. Contact of solid with dry skin causes mild irritation. Strong solutions can cause marked irritation or even a superficial burn.
5 3 **Treatment for Exposure.** INHALATION: move to fresh air, if discomfort persists, get medical attention. INGESTION: give large amounts of water. EYES: promptly flood with water and continue washing for at least 15 min, consult an ophthalmologist. SKIN: flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Grade 2, oral LD_{50} = 1 000 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Anhydrous grade dissolves with evolution of some heat
7 2 **Reactivity with Common Materials:** Metals will slowly corrode in aqueous solutions
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
555 ppm/168 hr rock bass/killed tap water
10 650 ppm 96 hr sunfish LD$_{50}$ fresh water
2 400 ppm/48 hr marine fish LL$_{m}$ sea water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640
2 Michigan Chemical Corp
351 E Ohio St
Chicago, Ill 60611
3 Allied Chemical Corp
Industrial Chemicals Div
P O Box 1139R
Morristown, N J 07960

10 SHIPPING INFORMATION

10 1 **Grades of Purity.** Technical 90 - 98% water solutions containing 51 - 86%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 110.99 (solute)
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.15 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** −292 Btu/lb = −162 cal/g = −6.79 × 10^5 J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CCR

CALCIUM CHROMATE

Common Synonyms
Calcium chromate (VI)
Gelbin yellow ultramarine
Steinbuhl yellow
Calcium chromate, dihydrate

Solid | Yellow | Odorless

Sinks and mixes slowly with water

Avoid contact with soft parts of body keep people away
Wear rubber overclothing including gloves
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Will increase the intensity of a fire

Heat and large amounts of water

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If in eyes hold eyelids apart and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
Will burn skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
If IN EYES hold eyelids apart and flush with plenty of water
If SWALLOWED and victim is CONSCIOUS induce vomiting by mechanical means, water or milk and give victim plenty of water to drink
If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting but keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Calcium chromate (VI)
Calcium chromate dihydrate
Gelbin Yellow Ultramarine
Steinbuhl Yellow

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $CaCrO_4 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** Yellow

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes severe circulatory collapse and chronic nephritis. Contact with eyes causes irritation. Contact with skin may cause dermatitis and ulcers.

5 3 **Treatment for Exposure:** INHALATION remove to fresh air. INGESTION give large amounts of water, induce vomiting. EYES flush with water for at least 15 min. SKIN treat local injuries like acid burns, scrub with dilute (2%) sodium hyposulfite solution

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 LD_{50} 500 mg/kg

5 7 **Late Toxicity:** Lung cancer may develop

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic chromium fume may be formed in fires

6 6 **Behavior in Fire.** The hydrated salt loses water when hot and changes color but no increase in hazard occurs

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential:** Bioconcentration up to 2000 fold possible under constant exposure. Not significant under spill conditions

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

3 Pfaltz and Bauer Inc
126-04 Northern Blvd
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 192.1

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** > 1 at 20 °C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** ? Btu/lb
= 41 cal/g = 1.7×10^5 J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

CCN — CALCIUM CYANIDE

Common Synonyms			
Cyanide of calcium	Solid	White to gray or black	Almond odor
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID OR SOLUTION. KEEP PEOPLE AWAY.

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED
DO NOT USE WATER ON CARBON DIOXIDE ON ADJACENT FIRE

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
MAY BE DANGEROUS IF IT ENTERS WATER INTAKES

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)
Issue warning: poison air contaminant, water contaminant
Restrict access
Evacuate area
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Cyanide of calcium
Cyanogas G Fumigant
Cyanogas A Dust

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $Ca(CN)_2$ plus inert ingredients

3 4 **IMCO/United Nations Numerical Designation.** 6 1/1575

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to gray to black

4 3 **Odor:** Compound reacts with moisture in air to form hydrogen cyanide gas which has a characteristic almond like odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus and full protective clothing including rubber footwear

5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, nausea, vomiting and weakness; high concentrations are rapidly fatal

5 3 **Treatment for Exposure:** *Call a doctor immediately.* INHALATION: break amyl nitrite pearl in cloth and hold lightly under nose for 15 sec., repeat 5 times at 15 sec. intervals; use artificial respiration if breathing stops. EYES: flush with water for 15 min.; do not allow water to enter nose or mouth. SKIN: flush with water; do not allow water to enter nose or mouth. INGESTION: break an amyl nitrite pearl in a cloth and hold lightly under nose for 15 sec.; if patient is conscious induce vomiting and repeat until vomit is clear; repeat inhalation of amyl nitrite 5 times at 15 sec. intervals; use artificial respiration if breathing has stopped

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m (as cyanide)

5 5 **Short-Term Inhalation Limits.** 5 mg/m for 30 min

5 6 **Toxicity by Ingestion:** Grade 4 oral LD_{50} = 39 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Use dry chemical, sand or earth on adjacent fires

6 4 **Fire Extinguishing Agents Not to be Used.** Do not use water or carbon dioxide on adjacent fires

6 5 **Special Hazards of Combustion Products:** Decomposes in fire to give very toxic gases including hydrogen cyanide

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Releases very poisonous hydrogen cyanide gas slowly on contact with water. Release is rapid if acid is also present

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable if kept dry

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.12 ppm 96 hr sunfish/TL_m/fresh water
>28 ppm 48 hr cockle/EC_{50}/salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. American Cyanamid Co.
Agricultural Division
P.O. Box 400
Princeton, N.J. 08540

2. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 42% with 58% inert ingredients. May contain up to 3% calcium carbide which releases flammable acetylene gas when wet

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Sealed containers in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 92

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.853 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 264 Btu/lb
= 147 cal/g = 6.14×10^5 J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

CAF — CALCIUM FLUORIDE

Common Synonyms			
Fluospar	Solid powder or granules	Gray	Odorless
	Sinks in water		

Fire

Not flammable

Exposure

SOLID
Harmful if swallowed
Not irritating to skin or eyes

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Fluospar
Fluorspar

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** CaF_2

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Gray

4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** For dusty conditions

5 2 **Symptoms Following Exposure:** Little acute toxicity

5 3 **Treatment for Exposure:** Usually no treatment needed

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0.5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
30000 ppm/* Tilapia vulgaris lethal/fresh water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Not pertinent

8 4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Div
Marcus Hook Pa 19061

2 Combustion Engineering Inc
C-E Minerals Div
443 South Gulph Rd
King of Prussia Pa 19406

3 Ozark Mahoning Co
Tulsa Oklahoma 74119

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Acid grade 97.4% Ceramic grade 98.5% Fine powder (dry or damp cake) Gravel fluorspar Pellet

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 78.08

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 3.18 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CAH — CALCIUM HYDROXIDE

Common Synonyms			
Slaked lime	Solid granules Sinks in water	White	Odorless

Fire

Not flammable

Exposure

ALL LOOK MEDICAL AID

DUST
Irritating to nose and throat if inhaled.

SOLID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Slaked lime
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $Ca(OH)_2$
3 4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust proof goggles and mask
5 2 **Symptoms Following Exposure:** Dust irritates eyes, nose and throat
5 3 **Treatment for Exposure:** INGESTION: have victim drink milk and water. Do NOT induce vomiting. EYES: flush with a gentle stream of water for at least 10 min. and consult an opthalmologist for further treatment without delay. SKIN: wash off the lime and consult a physician.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade [illegible] Dose [illegible] kg/gram
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** None
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 92 ppm 72 hr tilapia toxic fresh water
240 ppm 24 hr mosquito fish TL$_m$ fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Ash Grove Cement Co
3080 Ten Main Center
Kansas City, Mo 64105

2 Engelhard Minerals & Chemicals Corp
Minerals and Chemicals Division
Menlo Park, N J 08817

3 United States Gypsum Co
Chemicals Division
Chicago, Ill 60606

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Agricultural 68 71
industrial 70 73% chemical 71 73%
10 2 **Storage Temperature:** Data not available
10 3 **Inert Atmosphere:** Data not available
10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

11

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 74.09
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.24 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page CAH-A

NOTES

CHY — CALCIUM HYPOCHLORITE

Common Synonyms
STTH
HTH Dry Chlorine
Neutral anhydrous calcium hypochlorite
Senery

Solid granules | White | Household bleaching powder odor

Sinks and mixes with water

[illegible]

Fire

Not flammable
May cause fire on contact with combustibles.
POISONOUS GASES ARE PRODUCED WHEN HEATED
[illegible]

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
If swallowed, will cause nausea, vomiting or loss of consciousness
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - corrosive
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
HTH HTH Dry Chlorine
Neutral anhydrous calcium hypochlorite Senery

3 2 **Coast Guard Compatibility Classification:**
Not applicable

3 3 **Chemical Formula** $Ca(OCl)_2$

3 4 **IMCO United Nations Numerical Designation:** 5 1 1748

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Like bleaching powder

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective goggles dust mask

5 2 **Symptoms Following Exposure:** INHALATION hypochlorous acid fumes* cause severe respiratory tract irritation and pulmonary edema INGESTION pain and inflammation of mouth pharynx esophagus and stomach, erosion of mucous membranes chiefly of the stomach vomiting (hemorrhaging may cause vomitus to resemble coffee grounds) circulatory collapse with cold clammy skin cyanosis and shallow respirations confusion delirium coma edema of pharynx glottis, and larynx with stridor and obstruction perforation of esophagus or stomach with mediastinitis or peritonitis SKIN CONTACT may cause vesicular eruptions and eczematoid dermatitis

5 3 **Treatment for Exposure:** INGESTION swallow immediately milk egg white starch paste milk of magnesia aluminum hydroxide gel or magnesium trisilicate gel Avoid sodium bicarbonate because of the release of carbon dioxide Do not use acids antidotes cautious gastric lavage with tap water or a 1% solution of sodium thiosulfate milk of magnesia (1 oz) left in the stomach is useful as a mild antacid adsorbent demulcent and cathartic demulcents such as starch egg white milk gruel opiates for the control of pain Treat shock vigorously with intravenous fluids Prompt surgical intervention when indicated e g tracheotomy gastrotomy SKIN wash with liberal quantities of water and apply a paste of baking soda

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 1 Data above 15 g kg

*Gases are only if compound comes in contact with acid

Continued on page 4

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:**
Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Not pertinent

6 6 **Behavior in Fire:** Poisonous gases may be produced when heated

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
May cause fire on contact with wood or straw Corrosive to most metal

7 3 **Stability During Transport:** The 70% grade may decompose violently if exposed to heat or direct sunlight Gives off chlorine and chlorine monoxide above 350°F (poisonous gases)

7 4 **Neutralizing Agents for Acids and Caustics:** Dilute with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
0 5 ppm/* trout killed fresh water
*Time period not specified

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Not pertinent

8 4 **Food Chain Concentration Potential**
Not pertinent

9 SELECTED MANUFACTURERS

1 Olin Corp
Chemicals Division
Brandenburg Ky 40108

2 Pennwalt Corp
Chemical Division
4800 Biddle Ave
Wyandotte Mich 48192

3 PPG Industries Inc
Industrial Chemicals Division
Barberton Ohio 44203

10 SHIPPING INFORMATION

10 1 **Grades or Purity** 70% (self propagating)
65% (non propagating)

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Oxidizing material

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	1	2
Flammability (Red)	0	0
Reactivity (Yellow)	2	2
	oxy	oxy

*First column refers to non fire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 174 9*

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2 35 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4

5. HEALTH HAZARDS (Cont'd.)

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Irritates eyes skin and mucous membranes

5 10 **Odor Threshold:** Not pertinent

REVISED 1978

CAM — CALCIUM, METALLIC

Common Synonyms	Solid	Silvery to grayish white	Odorless
	Sinks in water. Reacts slowly with water.		

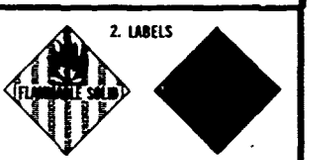
Fire	FLAMMABLE
Exposure	SOLID Will burn skin and eyes.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. High flammability.
Disperse and flush.

2. LABELS



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** Ca
3 4 **IMCO/United Nations Numerical Designation:** 4 3 1401

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Silvery; turns to grayish white on exposure to air
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles and rubber gloves
5 2 **Symptoms Following Exposure:** Contact with eyes or skin produces caustic burns
5 3 **Treatment for Exposure:** EYES or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (flammable solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Dry graphite, soda ash, powdered sodium chloride, or appropriate metal fire extinguishing dry powder
6 4 **Fire Extinguishing Agents Not to be Used:** Water, halogenated hydrocarbons, dry chemical, carbon dioxide
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Burns violently, especially if finely divided
6 7 **Ignition Temperature:** 1454 - 1832°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts to form flammable hydrogen gas, which may ignite. The reaction is not violent.
7 2 **Reactivity with Common Materials:** Reacts with moist air to form skin of hydroxide. The reaction is not hazardous.
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** See Calcium hydroxide (CAH)
8 2 **Waterfowl Toxicity:** See Calcium hydroxide (CAH)
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Pfizer Minerals
Metals and Composite Products Division
235 E. 42 Street
New York, N.Y. 10017

2 Gallard-Schlesinger Chemical Manufacturing Co.
Atomergic Chemetals Division
584 Mineola Ave.
Carle Place, L.I., N.Y. 11514

3 Cerac, Inc.
1460 West Silver Spring Rd.
Menomonee Falls, Wis. 53051

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99.5%; redistilled 99.9%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Sealed containers must be in a ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II RK

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	2
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 40.1
13 3 **Boiling Point at 1 atm:** 2,714°F = 1,490°C = 1,763°K
13 4 **Freezing Point:** 1,562°F = 850°C = 1,123°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.55 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** 6790 Btu/lb = 3770 cal/g = 158 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CNT

CALCIUM NITRATE

Common Synonyms

Solid | White | Odorless

Sinks and mixes with water

Fire

Not flammable
May cause fire on contact with combustibles.
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
Irritating to eyes, nose and throat

SOLID
Irritating to skin and eyes.
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Isolate warning - oxidizing material
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Calcium nitrate tetrahydrate
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $Ca(NO_3)_2 \cdot 4H_2O$
3 4 **IMCO/United Nations Numerical Designation:** 1454

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator and rubber gloves
5 2 **Symptoms Following Exposure:** Dust causes mild irritation of eyes
5 3 **Treatment for Exposure:** EYES or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable but may cause fire on contact with combustibles
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Flood with water
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** May give off toxic oxides of nitrogen when involved in fire
6 6 **Behavior in Fire:** Greatly intensifies the burning of all combustible materials
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Contact with combustible material may cause fire
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 10 000 ppm/96 hr/surface fish/fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. J T Baker Chemical Co
Phillipsburg, N J 08865
2. Mallinckrodt Chemical Works
222 West Side Avenue
P O Box 384
Jersey City, N J 07304
3. Ruston Chemicals Inc
P O Box 219
Steubenville, Ohio 43952

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Analytical reagent (99.0+% purified technical)
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-2

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 164
13 3 **Boiling Point at 1 atm:** Decomposes
13 4 **Freezing Point:** 1042°F = 561°C = 834°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.50 at 15°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
3 14 **Heat of Decomposition:** Not pertinent
3 15 **Heat of Solution:** [illegible] Btu/lb = −50 cal/g = −2.1 × 10⁵ J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 6

NOTES

CAO — CALCIUM OXIDE

Common Synonyms
Unslaked lime
Quicklime

Solid granules | White to grey | Odorless

Sinks and reacts violently with water. Water appears to boil.

[illegible]

Fire

Not flammable
May cause fire on contact with water and combustibles
[illegible]
DO NOT USE WATER ON ADJACENT FIRES

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to nose and throat
[illegible]
SOLID
Will burn skin and eyes.
Harmful if swallowed
[illegible]
INGESTION: [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: Cautionary
Restrict access
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Quicklime
Unslaked lime

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CaO

3.4 **IMCO United Nations Numerical Designation:** 9.0 1910

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White to gray

4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles and any type of respirator prescribed for fine dust.

5.2 **Symptoms Following Exposure:** Causes burns on mucous membrane and eyes. Inhalation of dust causes sneezing.

5.3 **Treatment for Exposure:** INGESTION: If victim is conscious, have him drink water or milk. DO NOT induce vomiting. SKIN AND EYES: Flush with water and seek medical help.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and mild severe burns on short exposure and may cause secondary burns on long exposure.

5.10 **Odor Threshold:** Not pertinent.

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Heat may cause ignition of combustibles. Material swells during reaction.

7.2 **Reactivity with Common Materials:** No reaction with water proper; then short effect is that of heat liberated

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 50 ppm/96 hr/[illegible]/salt water
240 ppm/24 hr/[illegible]/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

Allied Chemical Corp.
Specialty Chemicals Division
Morristown, N.J. 07960

[illegible]
Kansas City, Mo. 64105

United States Gypsum Co.
Chemicals Division
Chicago, Ill. 60606

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 96-98%

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

2.R

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** CFR 8

12.2 **IMO Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 56.08

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 3.3 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 of 4

NOTES

CCP

CALCIUM PEROXIDE

Common Synonyms
Calcium dioxide

Solid powder | Yellow to white | Odorless

Sinks in water

Fire

Not flammable
May cause fire on contact with combustibles
Containers may explode in fire

Exposure

DUST
Irritating to eyes, nose and throat

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

Issue warning: oxidizing material
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Calcium dioxide
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** CaO_2
3 4 **IMCO/United Nations Numerical Designation:** 1 1 [illegible]

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Yellow white
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U S B M approved dust, fume respirator, general purpose gloves, chemical safety goggles, full cover clothing
5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Dust also irritates eyes and skin on contact and irritates mouth and stomach if ingested
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: flush with water for 15 min and seek physician. SKIN: flush with water. INGESTION: give large amounts of water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Lethal Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable, but may cause fire on contact with combustible materials
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Flood with water or use dry powder (e.g. graphite or powdered limestone)
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Can increase severity of fire. Containers may explode
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts very slowly with water at room temperature to form hydrogen peroxide and oxygen gas
7 2 **Reactivity with Common Materials:** Heavy metals and dust can accelerate decomposition. Fume and oxygen. The reaction is not explosive
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

FMC Corporation
Industrial Chemicals Division
633 Third Avenue
New York, N Y 10017

2 Barium and Chemicals Inc.
P O Box 218
Steubenville, Ohio 43952

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 60+%
10 2 **Storage Temperature:** Stable
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, 4445.1)

II R R

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 72 1
13 3 **Boiling Point at 1 atm:** Decomposes
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 92 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** −135 Btu lb = −75 cal g = −3 2 × 10⁵ J kg
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CAL

CALCIUM PHOSPHATE

Common Synonyms
MCP Monocalcium phosphate monohydrate
Calcium biphosphate
DCP Dicalcium phosphate
Calcium pyrophosphate

Solid | White | Odorless

Sinks and mixes with water

[illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

Effect of low concentrations on aquatic life unknown
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** (a) MCP Monocalcium phosphate, monohydrate, Calcium phosphate, monobasic, monohydrate Acid calcium phosphate calcium superphosphate, Calcium biphosphate Primary calcium phosphate (b) DCP Dicalcium phosphate (anhydrous or dihydrate) Dibasic calcium phosphate, Calcium monohydrogen phosphate, Secondary calcium phosphate (c) TCP Calcium

Continued on page 4

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles and gloves

5 2 **Symptoms Following Exposure:** Inhalation of MCP or DCP may cause irritation of upper respiratory tract prolonged inhalation of concentrated pyrophosphate may cause a deposit of TCP in the lungs Ingestion of large quantities of any form of calcium phosphate may cause nausea vomiting cramps and diarrhea MCP may also be corrosive to membranes of mouth throat and gastrointestinal tract Local irritation of the eyes may result from contact with any of these phosphates prolonged or repeated exposure to MCP may lead to chronic conjunctivitis Contact with skin by MCP may cause local irritation or chronic dermatitis, prolonged or repeated contact with concentrated aqueous slurries of DCP may cause local irritation

5 3 **Treatment for Exposure:** INHALATION move to clean air see physician in case of persistent coughing expectoration, chest pain, or shortness of breath INGESTION get medical attention quickly induce vomiting by giving large amounts of water or warm salty water or by inducing back of patient's throat continue until vomitus is clear follow with milk eggs, or olive oil to soothe stomach EYES immediately flush with large quantities of running water for at least 15 min holding eyelids apart to insure thorough flushing of eyes and lids do not attempt to neutralize with chemical agents get medical attention quickly if physician is not available, continue irrigation for another 15 min SKIN immediately flush with water remove contaminated clothing under shower do not attempt to neutralize with chemical agent, get medical attention for persistent irritation

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 0 1 LD_{50} > 15g kg

Continued on page 4

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** None calcium phosphates form acid solutions in water These may attack metals with formation of flammable hydrogen gas which may collect in enclosed spaces
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Stauffer Chemical Co
Industrial Chemical Division
Westport Conn 06880

2 Mallinckrodt Chemical Works
222 Westside Avenue
P O Box 144
Jersey City N J 07304

3 Monsanto Company
800 North Lindbergh Blvd
St Louis Mo 63166

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** NF USP
Dentifrice Reagent
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

NS (MCP)
H (DCP calcium pyrophosphate)

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** Monocalcium phosphate 252 18 Dicalcium phosphate 136 06 Calcium pyrophosphate 254
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 Tat 20°C (solids)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

3 CHEMICAL DESIGNATIONS (Cont'd)

phosphate (b) basic salt Calcium pyrophosphate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:**
(a) $CaH_4P_2O_8 \cdot H_2O$
(b) $CaHPO_4$ or $CaHPO_4 \cdot 2H_2O$
(c) $Ca_2P_2O_7$
(d) Ca_3P_4O

3 4 **IMCO/United Nations Numerical Designation:** Not listed

Continued on page 3 and 4

5. HEALTH HAZARDS (Cont'd)

5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Tasteless odorless

CPP CALCIUM PHOSPHIDE

Common Synonyms

Photophor

Solid Gray Musty odor

Reacts violently with water Poisonous, flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
Wear goggles and self-contained breathing apparatus
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
IGNITES WHEN EXPOSED TO MOISTURE
POISONOUS GASES ARE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus
Extinguish with dry chemical, carbon dioxide
DO NOT USE WATER OR FOAM ON FIRE
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR PRODUCED IN REACTION WITH WATER
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

DUST
Irritating to eyes
Move victim to fresh air
If in eyes, hold eyelids open and flush with plenty of water

SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Hazard Response Methods Handbook CG-446-4)

Issue warning: high flammability, poison, air contaminant, water contaminant
Restrict access
Evacuate area (large discharge only)
Should be removed

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Photophor
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula:** Ca_3P_2
3.4 **IMCO/United Nations Numerical Designation:** 4.3/1360

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Gray
4.3 **Odor:** Musty, like acetylene

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Dust respirator, protective gloves and clothing, goggles
5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes faintness, weakness, nausea, vomiting. External contact with dust causes irritation of eyes and skin
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, call a physician and alert to possibility of phosphine poisoning. EYES or SKIN: flush with water. INGESTION: give large amounts of water, call physician and alert to possibility of phosphine poisoning
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** 1.100 mg/m³

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable but may ignite spontaneously if wetted
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents.** Extinguish adjacent fires with dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Can cause spontaneous ignition if wet. Contributes dense smoke of phosphoric acid
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously, generating phosphine (a poisonous, spontaneously flammable gas)
7.2 **Reactivity with Common Materials.** Can react with surface moisture to evolve phosphine which is toxic and spontaneously flammable
7.3 **Stability During Transport:** Stable if dry
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Ventron Corp
Alfa Products
P O Box 159
Beverly, Mass 01915

2 Cerac, Inc
s1460 W Silver Spring Rd
Menomonee Falls, Wis 53051

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Sealed containers must be in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

RR

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable solid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 182.2
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** (approx.) 2,910°F = 1,600°C = 1,870°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.51 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CRE — CALCIUM RESINATE

Common Synonyms
Metallic resinate
Calcium abietate
Calcium rosin
Calcium resinate, fused

Solid | Yellow to dark brown | Odorless

Sinks in water

Call fire department
Stop discharge if possible. Keep people away
Avoid contact with solid and dust
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
MAY IGNITE WHEN EXPOSED TO AIR
Extinguish with dry chemical, foam or carbon dioxide

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen
SOLID
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
If IN EYES, hold eyelids open and flush with plenty of water
If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing, except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify owners of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Calcium abietate, Calcium resinate, fused, Calcium rosin, Limed wood rosin, Metallic resinate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** (approx.) $Ca(OOCC_{19}H_{29})_2$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Amber, very dark brown
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, gloves
5 2 **Symptoms Following Exposure:** Inhalation of fumes from heated chemical may cause irritation of nose and throat. Ingestion causes irritation of nose and throat. Contact with eyes causes irritation. Contact of molten material with skin causes burns.
5 3 **Treatment for Exposure:** INHALATION: move victim to fresh air, get medical help immediately. INGESTION: give large amounts of water, induce vomiting. EYES: flush immediately with cold water, get medical help immediately. SKIN: if molten chemical burns skin, apply cold water immediately, get medical help for burn treatment.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** 480°F (may ignite spontaneously)
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Crosby Chemicals, Inc.
P.O. Box 460
Picayune, Miss. 39466

2 Reichold Chemicals, Inc.
Newport Division
P.O. Box 1433
Pensacola, Fla. 32596

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 683 (approx.)
13 3 **Boiling Point at 1 atm:** >610°F = >316°C = >589°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.13 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CPH	# CAMPHENE

Common Synonyms
3,3-Dimethyl-2-methylene norcamphane
2,2-Dimethyl-3-methylene-norbornane

Solid | White | Camphor like odor

Floats on water

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with solid and dust.
Isolate and restrict discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemicals, Foam, carbon dioxide
Water may be ineffective

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause headache or difficult breathing
If in eyes, hold eyelids apart and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids apart and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink WATER to dilute
IF SWALLOWED, if victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing, except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
2,2-Dimethyl 3 methylenenorbornane
3,3 Dimethyl 2-methylenenorcamphane
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $C_{10}H_{16}$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** Camphoraceous

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gloves and face shield
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION move victim to fresh air call physician immediately EYES flush immediately with clean, cool water call physician immediately SKIN wash with alcohol follow with soap and water wash
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:**
108°F O C , 92°F C C (typical)
6 2 **Flammable Limits in Air:**
Data not available
6 3 **Fire Extinguishing Agents.**
Foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.**
Water
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):**
Data not available
8 4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1 Hercules Inc
Organics Department
Wilmington Del 19899
2 Reichold Chemicals Inc
Newport Division
407 S Pace Boulevard
Pensacola Fla 32596
3 SCM Corporation
Glidden-Durkee Div
P O Box 389
Jacksonville, Fla 32201

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 75 +
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
ORM- A
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm**
Solid
13 2 **Molecular Weight:** 136
13 3 **Boiling Point at 1 atm:**
310°F = 154°C = 427°K
13 4 **Freezing Point:**
122°F = 50°C = 323°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.87 at 15°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension.**
Not pertinent
13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent
13 12 **Latent Heat of Vaporization:**
Not pertinent
13 13 **Heat of Combustion** −19 400 Btu/lb
= −10 800 cal/g = −452 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

CPO	# CAMPHOR OIL

Common Synonyms
Liquid camphor

Oily liquid Colorless or brown or blue Penetrating camphor odor

Usually floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical foam or carbon dioxide

Exposure

CALL FOR MEDICAL AID

VAPOR
Not irritating to eyes, nose or throat
Move to fresh air

LIQUID
Irritating to skin and eyes
If swallowed, will cause nausea, vomiting or loss of consciousness
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
Foaling to shoreline
May be dangerous if it enters water intakes.
Notify local health and pollution control officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Mechanical containment
Should be removed

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Liquid impure camphor
Liquid gum camphor

3 2 **Coast Guard Compatibility Classification**
Ketone

3 3 **Chemical Formula** $C_{10}H_{16}O$

3 4 **IMCO/United Nations Numerical Designation** 1130

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless, brown, blue

4 3 **Odor** Like camphor, fragrant and penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Eye protection

5 2 **Symptoms Following Exposure** Within 5 to 90 minutes after swallowing, the following may be noted: nausea and vomiting, feeling of warmth, headache, confusion, acute excitement, restlessness, delirium, and hallucinations, increased muscular excitability, tremors, and jerky movements, epileptiform convulsions, followed by depression, convulsions sometimes occur early in the syndrome and may be severe, but they do not have the grave prognosis of strychnine convulsions; coma, central nervous depression may at times be the primary clinical response; death results from respiratory failure, or from status epilepticus, slow recovery (several days or weeks), often with persistent gastric distress

5 3 **Treatment for Exposure:** For internal intoxication - symptomatic, gastric lavage, cathartics, diuretics and sedatives. Control convulsions with a short-acting barbiturate, chloral hydrate, or ether. DO NOT use antiseptics or opiates

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm

5 5 **Short-Term Inhalation Limits:** 3 ppm for 30 min

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 117°F C.C.

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used.**
Not pertinent

6 5 **Special Hazards of Combustion Products**
Not pertinent

6 6 **Behavior in Fire:** The solid often evaporates without first melting

6 7 **Ignition Temperature:** 466°C

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 CPC International Inc.
S B Penick and Co Division
100 Church St
New York, N Y 10007

2 Glyco Chemicals Inc
51 Weaver St
Greenwich, Conn 06830

3 R W Greef & Co Inc
1 Rockefeller Plaza
New York, N Y 10020

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Each lot of camphor oil has a unique composition which varies with the season of the year and the country of origin. At least a dozen grades are known; all have Chinese names. Most can now be sold in the U S as synthetic and is quite pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1 U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid (liquid if even slightly impure)

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm.**
>392°F = >200°C = >473°K

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity** 0.923 at 25°C (liquid)

13 8 **Liquid Surface Tension**
Data not available

13 9 **Liquid-Water Interfacial Tension**
Data not available

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:**
Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and A

NOTES

REVISED 1978

CLS CAPROLACTAM, LIQUID

Common Synonyms
Aminocaproic lactam
2-Ketohexamethyleneimine
2-Oxohexamethyleneimine
epsilon-Caprolactam
Hexahydro-2H azepine 2-one

Liquid | Colorless | Mild odor

Sinks and mixes with water

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Extinguish with water, dry chemicals, foam, or carbon dioxide.
Cool exposed containers with water.

Exposure

Call for medical aid.

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of canal water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Aminocaproic lactam, epsilon Caprolactam, Hexahydro 2H azepin 2 one, 2 ketohexamethylenimine

3 2 **Coast Guard Compatibility Classification:** Caprolactam solution

3 3 **Chemical Formula:** $HNCH_2CH_2CH_2CH_2CO$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gas mask or self-contained breathing apparatus, rubber gloves and boots, goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation causes coughing or mild irritation. Contact with hot liquid will burn eyes and skin.

5 3 **Treatment for Exposure:** INHALATION: remove patient to fresh air. EYES: wash with copious quantities of water for at least 15 min., call physician. SKIN: wash with water, call physician in case of thermal burn.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 2,140 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5 10 **Odor Threshold:** 0.3 mg/m³

6 FIRE HAZARDS

6 1 **Flash Point:** 257°F O.C., 230°F C.C.

6 2 **Flammable Limits in Air:** 1.84% (U.L.)

6 3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 2.4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Dow Badische Company
Williamsburg, Va. 23185

2 Allied Chemical Corporation
Plastics Division
P. O. Box 2365R
Morristown, N. J. 07960

3 Nipro Incorporated
P. O. Box 1485
Augusta, Ga. 30903

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** 99%

10 2 **Storage Temperature:** 75°C

10 3 **Inert Atmosphere:** Nitrogen cushion

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 113

13 3 **Boiling Point at 1 atm:** 518°F = 268°C = 541°K

13 4 **Freezing Point:** 154°F = 68°C = 341°K

13 5 **Critical Temperature:** 944.4°F = 506.9°C = 780.1°K

13 6 **Critical Pressure:** 660 psia = 45 atm = 4.6 MN/m

13 7 **Specific Gravity:** 1.02 at 77°C (liquid)

13 8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 77°C

13 9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 77°C

13 10 **Vapor (Gas) Specific Gravity:** 3.9

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 209 Btu/lb = 116 cal/g = 4.85×10^5 J/kg

13 13 **Heat of Combustion:** −13,700 Btu/lb = −7,640 cal/g = -320×10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** −324 Btu/lb = −180 cal/g = -7.5×10^5 J/kg

(Continued on pages 5 and 6)

NOTES

CPT

CAPTAN

Common Synonyms
N [(Trichloromethyl) thio]-4-cyclohexene-1, 2, -dicarboximide
N-trichloromethylthio-cis-Δ⁴-cyclohexene 1, 2, -dicarboximide
Orthocide
Vanicide

Solid | White to brown | Slight odor

Sinks in water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear goggles self-contained breathing apparatus and rubber clothing
Call fire department
Stay upwind use water spray to knock down dust
Isolate and remove discharged material
Notify local health and wildlife officials

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus
Extinguish with water dry chemicals foam or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.
Move victim to fresh air
Protect rescuer
If breath has stopped give artificial respiration
If heart has stopped give cardiac massage
SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have vomit induced promptly
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting give plenty of water

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Contact wildlife officials
Notify public if in navigable waters

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** N [(Trichloromethylthio) 4 cyclohexene 1 2-dicarboximide N Trichloromethylthio-cis-Δ⁴ cyclohexene-1 2-dicarboximide Orthocide Vanicide

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula:** $C_9H_8Cl_3NO_2S$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1609

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to buff

4 3 **Odor:** Slight pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask rubber gloves and goggles

5 2 **Symptoms Following Exposure:** Vapor irritates eyes Ingestion causes depression lachrymation labored respiration, diarrhea

5 3 **Treatment for Exposure:** Remove from exposure keep airways open administer artificial respiration if necessary EYES flush with water for 15 min and get medical attention SKIN wash with soap and water INGESTION maintain respiration induce vomit or lavage stomach if patient is unconscious give symptomatic and supportive treatment save agent and stomach for laboratory examination

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 oral rat LD_{50} = 450 mg kg

5 7 **Late Toxicity:** None observed in several species

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Flammable solid

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water carbon dioxide foam

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** Irritating and toxic gases are produced in a fire they may include sulfur dioxide hydrogen chloride phosgene and oxides of nitrogen

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 30 ppm 24 hr zebrafish 11 m fresh water

8 2 **Waterfowl Toxicity:** > 5,000 ppm 8 day

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Bioaccumulation not likely

9. SELECTED MANUFACTURERS

1 R T Vanderbilt Company Inc
230 Park Avenue
New York N Y 10017

2 Stauffer Chemical Co
Mountain View Calif 94040

3 Chevron Chemical Co
940 Hensley Street
Richmond Calif 94804

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical 90-97% also available as dusts wettable powders and aqueous suspension

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 442-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous class B

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 300 6

13 3 **Boiling Point at 1 atm.** Decomposes

13 4 **Freezing Point:** 338°F = 170°C = 443 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 74 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** (est.) = 7 100 Btu lb = −3 940 cal g = −16 5 × 10 J kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(Continued on page 5 and 6)

NOTES

CBY	# CARBARYL

Common Synonyms
Sevin
1-Naphthyl N-methyl-carbamate

Solid powder, or in solution — White to gray — Weak odor

Solid sinks in water; solution may float on water

Stop discharge if possible
Call fire department
Avoid contact with solid and vapor
Wear protective clothing
Notify safety and health agencies

Fire

Solid not flammable, but usually dissolved in combustible liquid
Extinguish with water fog, dry chemical or carbon dioxide

Exposure

CALL FOR MEDICAL AID
SOLID OR SOLUTION
Irritating to skin and eyes
Harmful if swallowed
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS have victim drink water, or milk and have victim induce vomiting
IF SWALLOWED and victim UNCONSCIOUS OR DELIRIOUS, DO NOTHING except keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Should be removed

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
1-naphthyl N-methylcarbamate
Sevin
3 2 **Coast Guard Compatibility Classification.**
Not applicable
3 3 **Chemical Formula** $C_{12}H_{11}NO_2$
3 4 **IMCO/United Nations Numerical Designation** 6 1 6; 1615

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Off-white
4 3 **Odor:** Weak

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Data not available
5 2 **Symptoms Following Exposure:** Data not available
5 3 **Treatment for Exposure:** SKIN AND EYE CONTACT flush affected tissues with water
INGESTION induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 5 mg/m³
5 5 **Short-Term Inhalation Limits:** Dust 30 mg/m³ for 30 min
5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 0 to 5 g/kg of LD_{50} 0 5 g/kg)
5 7 **Late Toxicity:** Liver damage to rats at high dose by mouth
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** Mild irritant
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 2 **Fire Extinguishing Agents:** Solution fires: Water, foam, dry chemical, CO_2
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate.** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
5 5 ppm 96 hr. Bioassay TL_m freshwater
0.013 ppm 48 hr. white shrimp TL_m salt water. Toxic to shrimp and crab species
8 2 **Waterfowl Toxicity** LD_{50} = 2170 mg/kg
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None observed

9 SELECTED MANUFACTURERS

Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:**
Sevin 50W wettable powder
Sevin sprayable 80% powder
Sevin 4 oil
10 2 **Storage Temperature:** Data not available
10 3 **Inert Atmosphere:** Data not available
10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

11

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
ORM A
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** 288°F = 142°C = 415°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.23 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

NOTES

REVISED 1978

CBO	# CARBOLIC OIL

Common Synonyms
Middle Oil
Liquefied phenol

Liquid — Colorless – darkens on exposure to light — Sweet tar odor

Sinks and mixes with water

AVOID CONTACT WITH LIQUID. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES ARE PRODUCED WHEN HEATED
Wear chemical protective suit with self-contained breathing apparatus.
Extinguish with water, dry chemical, foam or carbon dioxide.

Exposure

CALL FOR MEDICAL AID.
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Remove contaminated clothing and shoes.
Flush affected area with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water, milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: poison.
Restrict access.
Should be removed.
Chemical and physical treatment.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Middle oil
Liquefied phenol

3.2 **Coast Guard Compatibility Classification:**
Phenol

3.3 **Chemical Formula:** C_6H_5OH

3.4 **IMCO/United Nations Numerical Designation:** 9.0 16[1]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless; darkens on exposure to light

4.3 **Odor:** Sweet tar like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Fresh air mask for confined areas; rubber gloves; protective clothing; full face shield

5.2 **Symptoms Following Exposure:** Will burn eyes and skin. The analgesic action may cause loss of pain sensation. Readily absorbed through skin, causing increased heart rate, convulsions, and death.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; keep quiet and warm. If breathing stops, start artificial respiration. INGESTION: do NOT induce vomiting. Give milk, egg whites, or large amounts of water. Get medical assistance. No known antidote. EYES AND SKIN: remove contaminated clothing. Flush eyes with water for 15 minutes or until physician arrives. Wash skin with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Causes cancer in experimental animals

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Emits severe skin irritant. May cause pain and second degree burns after a few minutes' contact.

5.10 **Odor Threshold:** 0.05 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 175°F CC, 175°F CC

6.2 **Flammable Limits in Air:**
1.3% - 9.6%

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6.5 **Special Hazards of Combustion Products:**
Unburned vapors toxic

6.6 **Behavior in Fire:** Yields flammable vapors when heated, which will form explosive mixtures with air

6.7 **Ignition Temperature:** 1319°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 3.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
TLm 25 mg/l/96 hr/bluegill; TLm/fresh water
1.5 ppm/48 hr/rainbow trout; TLm/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
20% 5 days

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich. 48640

2 Monsanto Co
Monsanto Polymers and Petrochemicals Co
800 N. Lindbergh Blvd.
St. Louis, Mo. 63166

3 United States Steel Corp.
USS Chemicals Division
Clairton, Pa. 15025

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
96-92% phenol/80-82% phenol
(Remainder consists of cresol and water)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

V P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	3
Reactions	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 94.11

13.3 **Boiling Point at 1 atm.**
359.2°F = 181.8°C = 455.0°K

13.4 **Freezing Point:**
<105.6°F = <40.9°C = <314.1°K

13.5 **Critical Temperature:**
790.0°F = 421.1°C = 694.3°K

13.6 **Critical Pressure:**
889 psia = 60.5 atm = 6.13 MN/m²

13.7 **Specific Gravity:** 1.04 at 41°C (liquid)

13.8 **Liquid Surface Tension.**
41 dynes/cm = 0.041 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.089

13.12 **Latent Heat of Vaporization:**
129.6 Btu/lb = 72.0 cal/g = 3.014 × J/kg

13.13 **Heat of Combustion:** −13,401 Btu/lb
= −7445 cal/g = −311.70 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

*Data applies to phenol, the principal constituent

Continued on pages 5 and 6

NOTES

REVISED 1978

CDO CARBON DIOXIDE

Common Synonyms
Carbonic acid gas
Carbonic anhydride

Liquefied compressed gas or solid — Colorless gas or white solid — Odorless

Solid sinks and boils in water. Visible vapor cloud is produced.

AVOID CONTACT WITH LIQUID AND SOLID. KEEP PEOPLE AWAY.
Wear goggles, self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Stop leak if no hazard is involved.

Fire

Not flammable.
Containers may explode in fire.
Contact of liquid or solid with water may cause rapid boiling and splattering.

Exposure

Call for medical aid.

VAPOR

If inhaled will cause dizziness, or difficult breathing.
Move victim to fresh air.
If breathing is difficult, give oxygen.

LIQUID OR SOLID

Will cause frostbite.
Flush affected areas with plenty of water.
DO NOT RUB AFFECTED AREAS.

Water Pollution

Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Restrict access.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Carbonic acid gas; Carbonic anhydride
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** CO_2
3.4 **IMCO/United Nations Numerical Designation:** 1013

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas or solid ("Dry Ice")
4.2 **Color:** Colorless
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus in excessively high CO concentration areas. For handling liquid or solid: wear safety goggles or face shield, insulated gloves, long sleeved shirt, and trousers worn outside boots or over high top shoes to shed spilled liquid.

5.2 **Symptoms Following Exposure:** Inhalation causes increased respiration rate, headache, subtle physiological changes for up to 5% concentration and prolonged exposure. Higher concentrations can cause unconsciousness and death. Solid can cause cold contact burns. Liquid or cold gas can cause freezing injury to skin or eyes similar to a burn.

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air. SKIN: treat burns from contact with solid in same way as frostbite.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5000 ppm

5.5 **Short-Term Inhalation Limits:** 30 000 ppm for 60 min

5.6 **Toxicity by Ingestion:** Not pertinent (gas with low boiling point)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Containers may explode when heated
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 100-200 mg/l for various organisms LC; fresh water; time period not specified
8.2 **Waterfowl Toxicity:** Inhalation 5-8%; no effect
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Chemetron Corporation
Cardox Products Division
111 E. Wacker Drive
Chicago, Ill. 60601
2. Union Carbide Corporation
Linde Division
Morristown, N.J. 08057
3. Liquid Carbonic Corporation
135 S. LaSalle St.
Chicago, Ill. 60603

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Research 99.995+%; Instrument 99.99+%; Bone Dry 99.8+%; Commercial 99.5+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Liquid: safety relief; solid: open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NC-II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Nonflammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 44.0
13.3 **Boiling Point at 1 atm:** Not pertinent (sublimes)
13.4 **Freezing Point:** $-109.3°F = -78.5°C = 194.7°K$
13.5 **Critical Temperature:** $88°F = 31°C = 304°K$
13.6 **Critical Pressure:** 1 070 psia = 72.9 atm = 7.40 MN/m
13.7 **Specific Gravity:** 1.56 at −79°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 1.53
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0474
13.12 **Latent Heat of Vaporization:** 150 Btu/lb = 83 cal/g = 3.5 × 10⁵ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

CBB CARBON BISULFIDE

Common Synonyms
Carbon disulfide

Watery liquid Colorless to yellow Rotten egg to sweet odor

Sinks in water Flammable, irritating vapor is produced

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Dike and recover discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).
Extinguish with dry chemical, CO2 or carbon dioxide.
Water and foam may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Manual, 1978, CG-446-4)

Isolate warning: high flammability
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Carbon disulfide
3 2 **Coast Guard Compatibility Classification:** Carbon disulfide
3 3 **Chemical Formula:** CS_2
3 4 **IMCO United Nations Numerical Designation:** 3 1 1131

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Fairly sweetish, distasteful, offensive, like that of decaying cabbage

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Only self-contained breathing mask with full face approved by the United States Bureau of Mines is recommended. If the vapor concentration exceeds 2% by volume or is unknown, supplied air respirators equipment of appropriate design with full face masks should be used by all persons entering contaminated area. Masks should be used only for emergency situations and should be located accordingly. Almost any type of industrial clothing is satisfactory. Splashes of small quantities are not harmful to fabrics, and evaporation from clothing is quite rapid. Clothing should, however, be removed and the skin washed with water. Goggles should be used when the eyes are in danger of CS_2 splashes or sprays.

5 2 **Symptoms Following Exposure:** ACUTE EXPOSURE: mild to moderate irritation of skin, eyes and mucous membranes from liquid or concentrated vapors; headache, garlicky breath, nausea, vomiting, diarrhea (even after vapor exposures) and excessive salivation; abdominal pain; weak pulse; palpitations; fatigue; weakness in the legs; unsteady gait; vertigo; mania; hallucinations of sight, hearing, taste and smell in acute, massive vapor exposures; central nervous depression with respiratory paralysis; death may occur during coma or after convulsion.

5 3 **Treatment for Exposure:** INHALATION: remove victim promptly from contaminated area. Administer oxygen and artificial respiration if needed. SKIN CONTACT: wash affected areas with copious quantities of water. INGESTION: induce vomiting and follow with gastric lavage and saline cathartics.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 20 ppm

5 5 **Short-Term Inhalation Limits:** 100 ppm for 30 minutes; 200 ppm for 10 minutes; 100 ppm for 30 minutes and 50 ppm for 60 minutes.

6 FIRE HAZARDS

6 1 **Flash Point:** −22°F (C.C.)
6 2 **Flammable Limits in Air:** 1.3% - 50%
6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic gases are generated. Wear self contained breathing apparatus.
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 212°F
6 8 **Electrical Hazard:** Contact of the liquid or vapor with the surface of a lighted electric light bulb could cause ignition.
6 9 **Burning Rate:** 2.7 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 35 ppm/48 hr/mosquito fish/TL_m/fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 FMC Corp.
Inorganic Chemicals Div.
633 Third Ave.
New York, N.Y. 10017

2 PPG Industries Inc.
Industrial Chemicals Div.
Barberton, Ohio 44203

3 Stauffer Chemical Co.
Industrial Chemicals Div.
Delaware Co., Delaware 19026

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial, technical, USP
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Inerted
10 4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

W-N-Y

12. HAZARD CLASSIFICATIONS

12 * **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4*
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 76.14
13 3 **Boiling Point at 1 atm:** 115°F = 46.3°C = 319.5°K
13 4 **Freezing Point:** −169.9°F = −112°C = 161°K
13 5 **Critical Temperature:** 523°F = 273°C = 546°K
13 6 **Critical Pressure:** 1100 psia = 76 atm = 7.7 MN/m²
13 7 **Specific Gravity:** 1.26 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 32 dynes/cm = 0.032 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** 48.4 dynes/cm = 0.048 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** 2.6
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.2
13 12 **Latent Heat of Vaporization:** 154 Btu/lb = 86 cal/g = 3.59 × 10⁵ J/kg
13 13 **Heat of Combustion:** −5614 Btu/lb = −3220 cal/g = −13.2 × 10⁶ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

5. HEALTH HAZARDS (Cont'd)

5 6 **Toxicity by Ingestion:** Grade 2, rat LD_{50} = 0.1 - 0.99 g/kg
5 7 **Late Toxicity:** Non specific liver cell damage in rats, higher incidence of upper respiratory disease in humans
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effects are temporary.
5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns on long exposure.
5 10 **Odor Threshold:** 0.21 ppm

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CMO — CARBON MONOXIDE

Common Synonyms: Monoxide

Compressed gas or liquefied compressed gas | Colorless | Odorless

Liquid floats and boils on water. Poisonous flammable gas/air mixture vapor cloud is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.

Fire

FLAMMABLE
Containers may explode in fire.

Exposure

CALL FOR MEDICAL AID.

VAPOR
POISONOUS IF INHALED

LIQUID
Will cause frostbite.

Water Pollution

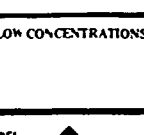
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, high flammability
Restrict access
Evacuate area

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Monoxide
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** CO
3.4 **IMCO/United Nations Numerical Designation:** 2/1016

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas or liquefied gas
4.2 **Color:** Colorless
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus, safety glasses and safety shoes. Type D or Type S canister mask.

5.2 **Symptoms Following Exposure:** Inhalation causes headache, dizziness, weakness of limbs, confusion, nausea, unconsciousness and finally death. 0.04% conc. 2 hr or 0.6% conc. 1 hr: headache and discomfort with moderate exercise. 0.1-0.2% will produce throbbing in the head in about 2 hr, tendency to stagger in about 1 hr, and confusion of the mind, headache and nausea in about 2 hrs. 0.2-0.25% usually produces unconsciousness in about 1 hr. Inhalation of a 0.4% conc. can prove fatal in less than 1 hr. Inhalation of high concentrations can cause sudden unexpected collapse. Contact of liquid with skin will cause frostbite.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure, give oxygen if available, support respiration, call a doctor. SKIN: if burned by liquid, treat as frostbite.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm

5.5 **Short-Term Inhalation Limits:** 400 ppm 15 min

5.6 **Toxicity by Ingestion:** Not pertinent (gas with low boiling points)

5.7 **Late Toxicity:** Toxicity from overexposure persists for many days.

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent.
6.2 **Flammable Limits in Air:** 12% - 75%
6.3 **Fire Extinguishing Agents:** Let fire burn, shut off flow of gas and cool adjacent containers with water. Extinguish fire (if wearing self-contained breathing apparatus) with dry chemicals or carbon dioxide.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Asphyxiation due to carbon dioxide production may result.
6.6 **Behavior in Fire:** Flame has very little color. Containers may explode in fire.
6.7 **Ignition Temperature:** 1128°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1.5 ppm TL for minnows and sunfish, killed, fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc.
Special Gas & Equipment Dept.
7201 W. Broad Street
Emmaus, Pa. 18049

2. Matheson Gas Products
East Rutherford, N.J. 07073

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Liquid 98.6+% Gas Research High Purity, CP (99.5%) Technical (99.0+%) Commercial (95.5+%)
10.2 **Storage Temperature:** Ambient (for gas); -312.7°F (for liquid)
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C D E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 28.0
13.3 **Boiling Point at 1 atm:** -312.7°F = -191.5°C = 81.7°K
13.4 **Freezing Point:** -326°F = -199°C = 74°K
13.5 **Critical Temperature:** -220°F = -140°C = 133°K
13.6 **Critical Pressure:** 507.5 psia = 34.51 atm = 3.502 MN/m²
13.7 **Specific Gravity:** 0.791 at -191.5°C (liquid)
13.8 **Liquid Surface Tension:** 9.8 dynes/cm = 0.009 N/m at -193°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 0.97
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3962
13.12 **Latent Heat of Vaporization:** 92.8 Btu/lb = 51.6 cal/g = 2.16 × 10⁵ J/kg
13.13 **Heat of Combustion:** -4 443 Btu/lb = -2 412 cal/g = -10.1 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CBT	# CARBON TETRACHLORIDE

Common Synonyms
Carbon Tet
Tetrachloromethane

Watery liquid | Colorless | Sweet odor

Sinks in water. Poisonous vapor is produced.

[illegible] liquid and vapor. Keep people away [illegible] Do not breathe vapor. Apply foam. Stop discharge if possible. [illegible]

Fire

Not flammable.
POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED.
[illegible] and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
Irritating to eyes
Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.
LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
Remove contaminated clothing and shoes. Flush affected areas with plenty of water.
IF EYES are affected, flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water. Induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and [illegible] authorities.
Notify operators of [illegible] water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-6

Issue warning: [illegible] person
Restrict access
Should be removed

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Benzinoform
Necatorina
Perchloromethane
Tetrasol
Tetrasolmethane

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:** CCl_4

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweetish, aromatic, mobile oil, stinging ethereal, somewhat resembling that of chloroform

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister with a full facemask; protective rubber gloves.

5.2 **Symptoms Following Exposure.** Dizziness, incoordination, anesthesia, may be decomposed by nausea and liver damage. Kidney damage also occurs, often producing decrease or stopping of urine output.

5.3 **Treatment for Exposure:** EYES AND SKIN: flush with plenty of water for eyes; get medical attention. Remove contaminated clothing and wash before reuse. INHALATION: immediately remove to fresh air. Keep patient warm and quiet and get medical attention promptly. Start artificial respiration if breathing stops. INGESTION: induce vomiting and get medical attention promptly. No specific antidote known.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limits:** [illegible] ppm for [illegible] minutes

5.6 **Toxicity by Ingestion:** Grade 2 [illegible] Single dose oral LD50 [illegible] gm/kg

5.7 **Chronic Toxicity:** Causes severe liver damage and death of organs.

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes moderate irritation such that personnel would find be a concentration unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If exposed on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Greater than 10 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Fumes, poisonous phosgene gas when exposed to open flames

6.6 **Behavior in Fire:** Decomposes to form chlorine and phosgene

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible] Chemical Co.
Midland, Michigan 48640

2. FMC Corp.
Industrial Chemical Div.
[illegible] Third Ave.
New York, N.Y. [illegible]

3. Stauffer Chemical Co.
Industrial Chem. Sales Div.
[illegible] Monroe, Michigan [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, technical, USP

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, (CG-446-2)

CX

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reactive	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):**

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible] on page 7 and 8

NOTES

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CAR	# CARENE

Common Synonyms

3-Carene
Isodrene
4,7,7-Trimethyl-3-norcarene
3,7,7-Trimethylbicyclo[4.1.0]hept-3-ene

Liquid Colorless Sweet turpentine-like odor

Floats on water

[illegible]

Fire

Combustible
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, coughing or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Foaming to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning [illegible] flammability
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 3-Carene Isodrene
4,7,7-Trimethyl-3-norcarene
3,7,7-Trimethylbicyclo[4.1.0]hept-3-ene

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{10}H_{16}$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweet, pungent, like turpentine

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air-supplied mask, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes headache, confusion, respiratory distress. Ingestion irritates entire digestive system and may cause redness of lungs if liquid enters lungs it causes severe pneumonitis. Contact with eyes or skin causes irritation.

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air, call a doctor, administer artificial respiration and oxygen if required. INGESTION: give large amounts of water and induce vomiting, call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limit:** Data not available.

5.6 **Toxicity by Ingestion:** Grade 2; oral rat LD_{50} = 4.1 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective on fire

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Will attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Northwest Petrochemical Corp
P.O. Box [illegible]
Atlantic, Wash. 98221

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A T 1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 136

13.3 **Boiling Point at 1 atm:**
318°F = 170°C = 443°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.860 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion:** (est.) = -19,170 Btu/lb = -10,740 cal/g = -450 × 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

CTC

CATECHOL

Common Synonyms
Oxyphenic acid
Pyrocatechinic acid
Pyrocatechuic acid

Solid | White | Odorless

Sinks and mixes with water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Insure worker water contaminant
Disperse and flush

2. LABELS

No hazard labels required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2 Benzenediol; Catechin; 1,2 Dihydroxybenzene; ortho-Dihydroxybenzene; Oxyphenic acid; Pyrocatechin; Pyrocatechinic acid; Pyrocatechol; Pyrocatechuic acid

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_6H_4(OH)_2$

3.4 **IMCO/UN Hazard Class and/or Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator if required, rubber gloves, apron and boots. Face shield

5.2 **Symptoms Following Exposure:** Inhalation of dusts or mists may cause irritation of eyes, nose, and throat. Ingestion may cause convulsions and respiratory failure. Contact with eyes causes burns and possible permanent impairment of vision. Prolonged or repeated contact with skin may cause burn

5.3 **Treatment for Exposure:** INHALATION: if ill effects occur, get medical attention. INGESTION: promptly give 8 oz. glasses of water and induce vomiting, get medical attention promptly. No specific antidote known. EYES and SKIN: immediately flush with plenty of water for at least 15 min. For eyes, get medical attention promptly. Remove and wash all contaminated clothing before reuse

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; LD$_{50}$: 5 g/kg (rats)

5.7 **Late Toxicity:** Causes tumors in mice

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] 261°F C.C.

6.2 **Flammable Limits in Air:** Not pertinent (combustible solid)

6.2 **Fire Extinguishing Agents:** Dry chemical, alcohol, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water and foam may be ineffective

6.5 **Special Hazards of Combustion Products:** May form toxic fumes at high temperatures

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] ppm/48 hr/goldfish/TL$_m$

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. [illegible] Zeiterbach Corp.
Chemical Products Div.
Camas, Wash. 98607

2. Dow Chemical Co.
Midland, Mich. 48640

3. Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

*10.1 **Grades of Purity:**
CP: high purity 99.5+%
NF: extremely high purity 99.9+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NS

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 110.11

13.3 **Boiling Point at 1 atm:** [illegible] = 245.5°C = 473.9°K

13.4 **Freezing Point:** 219.7°F = 104.3° = 377.5 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.344 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.*0 **Vapor (Gas) Specific Gravity:** Not pertinent

13.** **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.*3 **Heat of Combustion:** −11,200 Btu/lb = −6,220 cal/g = −260 × 10^3 J/kg

13.*4 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.*6 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

CPS	# CAUSTIC POTASH SOLUTION

Common Synonyms	Thick liquid	Colorless	Odorless
Potassium hydroxide solution Lye	Sinks and mixes with water		

AVOID CONTACT WITH LIQUID Keep people away
Wear rubber overclothing (including gloves)
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes.
Harmful if swallowed

Remove contaminated clothing at once
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning re corrosive
Restrict access
Dispose and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Potassium hydroxide solution; Lye
3 2 **Coast Guard Compatibility Classification:** Caustic
3 3 **Chemical Formula** KOH H_2O
3 4 **IMCO/United Nations Numerical Designation:** 8 0/1814

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Wide brimmed hat and close fitting safety goggles equipped with rubber side shields long sleeved cotton shirt or jacket with buttoned collar and buttoned sleeves rubber or rubber coated canvas gloves (Shirt sleeves should be buttoned over the gloves so that any spilled material will run down the outside) Rubber safety toe shoes or boots and cotton coveralls (The coveralls cuffs should be worn outside of boots) Rubber apron

5 2 **Symptoms Following Exposure:** Causes severe burns of eyes skin and mucous membranes

5 3 **Treatment for Exposure** (Act quickly) EYES flush with water for at least 15 min SKIN flush with water then rinse with dilute vinegar (acetic acid) INGESTION give water and milk Do NOT induce vomiting Call physician at once even when injury seems to be slight

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion** Grade 2, oral rat LD_{50} = 365 mg/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant Causes second and third degree burns on short contact and is very injurious to the eyes

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature.** Not flammable
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** None
7 2 **Reactivity with Common Materials.** Attacks wool leather and some metals such as aluminum tin lead and zinc to produce flammable hydrogen gas Separate from easily ignitible materials
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Dilute with water and rinse with dilute acid such as acetic acid
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 80 ppm/24 hr tm goldfish TL_m fresh water (these figures are for 100 percent hydroxide)
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Diamond Shamrock Corp
Diamond Shamrock Chemical Co
Electro Chemicals Div
Deer Park Texas 77536

2 Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St Louis Mo 63166

3 Occidental Petroleum Corp
Hooker Chemical Corp
Industrial Chemicals Div
Niagara Falls N Y 14302

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 45 90%
10 2 **Storage Temperature:** Ambient or elevated
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive material

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight** Not pertinent
13 3 **Boiling Point at 1 atm** >280 F = >130°C = >403°K
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 1 45 1 50 at 20°C (liquid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** (est) −17 Btu/lb = −10 cal/g = −0 4 × 10⁵ J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and

NOTES

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CSS

CAUSTIC SODA SOLUTION

Common Synonyms
Sodium hydroxide solution
Lye

Thick liquid | Colorless | Odorless

Sinks and mixes with water

AVOID CONTACT WITH LIQUID. Keep people away.
Wear rubber overclothing including gloves.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive.
Restrict access.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.**
Sodium hydroxide solution
Lye

3 2 **Coast Guard Compatibility Classification**
Caustic

3 3 **Chemical Formula:** NaOH H O

3 4 **IMCO/United Nations Numerical Designation.** 8 0/1824

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Wide brimmed hat, safety goggles with rubber side shields, tight fitting cotton clothing, rubber gloves under shirt cuffs, rubber boots and apron.

5 2 **Symptoms Following Exposure.** Causes severe burns of eyes, skin, and mucous membranes.

5 3 **Treatment for Exposure:** (Act quickly) EYES: Flush with water at once for at least 15 min. SKIN: flush with water, then rinse with dilute vinegar (acetic acid). INGESTION: give water and milk. Do NOT induce vomiting. Call physician at once even when injury seems to be slight.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5 5 **Short-Term Inhalation Limits.** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2, oral rabbit LD_{50} = 500 mg/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third-degree burns on short contact and very injurious to the eyes.

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Corrosive to aluminum, zinc, and tin. Contact with some metals may generate hydrogen gas, which is explosive and flammable.

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, rinse with dilute acetic acid.

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
125 ppm, 96 hr, mosquito fish/TLm, fresh water
180 ppm, 24 hr, oysters, larvae/salt water
(These figures are for 100% sodium hydroxide)

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Diamond Shamrock Corp.
Electrochemicals Division
Painesville, Ohio 44077

2 Dow Chemical Co.
Midland, Mich. 48640

3 PPG Industries, Inc.
Industrial Chemicals Division
Barberton, Ohio 44203

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 73%

10 2 **Storage Temperature:** Ambient or elevated

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive material

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:**
>266°F = >130°C = >403°K

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.5 at 20°C

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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CHC — CHARCOAL

Common Synonyms
Vegetable carbon
Animal carbon
Activated charcoal
Wood charcoal
Shell charcoal

Solid powder, lumps, or grains — Black — Odorless

May float or sink in water

Shut off ignition sources. Call fire department.
Stay upwind. Use water spray to knock down dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flood discharge area with water.

Exposure

DUST
Irritating to eyes, nose and throat.
Move victim to fresh air.
If in eyes, hold lids open and flush with plenty of water.

SOLID
Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Vegetable carbon, Vegetable charcoal, Animal carbon, Animal charcoal, Mineral carbon, Mineral charcoal, Activated charcoal, Wood charcoal, Shell charcoal
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** C
3.4 **IMCO/United Nations Numerical Designation:** 4.2/1361, 1362

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Powder, lumps, grains, or sticks
4.2 **Color:** Black
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator for dust
5.2 **Symptoms Following Exposure:** No significant symptoms
5.3 **Treatment for Exposure:** No treatment required
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Non-toxic (actually used in therapy of poisoning cases)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Flammable solid, may ignite spontaneously in air
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water.
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products:** Incomplete combustion forms toxic carbon monoxide
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 600-750°F
6.8 **Electrical Hazard.** Class I, Group I
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** May ignite spontaneously in air
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity.** None
8.2 **Waterfowl Toxicity:** None
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Barneby Cheney Co
Cassady at Eighth Street
Columbus, Ohio 43216

2 North American Carbon, Inc.
P. O. Box 19737
Columbus, Ohio 43219

3 Union Carbide Corp.
Carbon Products Division
270 Park Avenue
New York, N. Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Various grades, those containing appreciable volatile material are more likely to catch fire. All shipments must be exposed to air and so certified.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable solid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 12
13.3 **Boiling Point at 1 atm.** Very high
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure.** Not pertinent
13.7 **Specific Gravity:** 2 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** 14,100 Btu/lb = 7,830 cal/g = 328×10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

CDN

CHLORDANE

Common Synonyms
Chlordan
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene
Toxichlor
Octa-Klor
Velsicol 1068

Liquid or solution | Brown | Sharp odor

Sinks in water

AVOID CONTACT WITH FOOD TO KEEP PEOPLE AWAY
[illegible]

Fire

Not flammable but solution may be combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

CALL FOR MEDICAL AID
LIQUID OR SOLUTION
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
[illegible]
DO NOT BE AFFECTED BY AREAS
IF IN EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Chlordan 1,2,4,5,6,7,8,8-Octachloro-2 3 3a,4,7,7a hexahydro-4,7-methanoindene, Velsicol 1068, CD-68, Toxichlor, Octa Klor

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $C_{10}H_6Cl_8$

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1615

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Brown

4 3 **Odor:** Penetrating aromatic slightly pungent like chlorine

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirator for sprays fogs or dust goggles rubber gloves

5 2 **Symptoms Following Exposure:** Moderately irritating to eyes and skin Ingestion absorption through skin or inhalation of mist or dust may cause excitability convulsions nausea vomiting, diarrhea and some local irritation of the gastrointestinal tract

5 3 **Treatment for Exposure:** INHALATION administer oxygen and give fluid therapy, do not give epinephrine since it may induce ventricular fibrillation, enforce complete rest EYES flush with water for at least 15 min SKIN wash off skin with adequate quantities of soap and water do NOT scrub INGESTION induce vomiting and follow with gastric lavage and administration of saline cathartics ether and barbiturates may be used to control convulsions oxygen and fluid therapy are also recommended do NOT give epinephrine Since no specific antidotes are known symptomatic therapy must be accompanied by complete rest

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 5 mg m³

5 5 **Short-Term Inhalation Limits:** 2 mg m³ for 30 min

5 6 **Toxicity by Ingestion** Grade 3 oral LD_{50} = 283 mg/kg (rat)

5 7 **Late Toxicity:** Possible liver damage loss of appetite and weight

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Solution 225°F O C
132°F C C Solid is not flammable

6 2 **Flammable Limits in Air:** 0 7% 5% (kerosene solution)

6 3 **Fire Extinguishing Agents:** Dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective on solution fire

6 5 **Special Hazards of Combustion Products.** Irritating and toxic hydrogen chloride and phosgene gases may be formed when kerosene solution of compound burns

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** 410°F (kerosene solvent)

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport.** Stable to 160°F

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
0 5 ppm/96 hr/goldfish/ TL$_m$/fresh water

8 2 **Waterfowl Toxicity:** LD_{50} = 1 200 mg kg

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** High

9 SELECTED MANUFACTURERS

1 Velsicol Chemical Corp
341 East Ohio Street
Chicago Ill 60611

2 S B Penick & Co
100 Church Street
New York N Y 10007

3 Chemplar Chemical Co
260 Madison Avenue
New York N Y 10016

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical A variety of dusts, powders, and solutions in kerosene containing 2-80% chlordane are shipped

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES*

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 409 8

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 6 at 25°C (liquid)

13 8 **Liquid Surface Tension** (est) 25 dynes/cm = 0 025 N m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est) 50 dynes/cm = 0 05 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est) −4 000 Btu lb = −2 200 cal/g = −93 × 10³ J kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

* Properties refer to undiluted, technical-grade chlordane

Continued on pages 5 and 6

NOTES

CLX

CHLORINE

Common Synonyms	Liquefied compressed gas Greenish yellow Irritating, bleach-like choking odor Sinks and boils in water Poisonous, visible vapor cloud as produced

AVOID CONTACT WITH LIQUID AND VAPOR Keep people away
[illegible]

Fire

Not flammable
May cause fire on contact with combustibles
POISONOUS GASES ARE PRODUCED IN FIRES
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Will burn eyes
[illegible]
IF IN EYES hold eyelids open and flush with plenty of water

LIQUID
Will burn skin and eyes
Will cause frostbite
[illegible]
IF IN EYES hold eyelids open and flush with plenty of water
DO NOT RUB AFFECTED AREAS

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

- 3 1 **Synonyms:** No common synonyms
- 3 2 **Coast Guard Compatibility Classification:** Halogen
- 3 3 **Chemical Formula:** Cl_2
- 3 4 **IMCO/United Nations Numerical Designation:** 2 0 1017

4. OBSERVABLE CHARACTERISTICS

- 4 1 **Physical State (as shipped):** Liquefied compressed gas
- 4 2 **Color:** Greenish yellow
- 4 3 **Odor:** Characteristic choking

5 HEALTH HAZARDS

- 5 1 **Personal Protective Equipment:** Quick opening safety shower and eye fountain. respirators equipment approved for chlorine service. Wear safety goggles at all times when in vicinity of liquid chlorine
- 5 2 **Symptoms Following Exposure:** Eye irritation, sneezing, copious salivation, general excitement and restlessness. Irritation may persist for several days. High concentrations cause respiratory distress and violent coughing often with retching. Death may result from suffocation
- 5 3 **Treatment for Exposure:** INHALATION: remove victim from source of exposure, call a doctor, support respiration, administer oxygen. EYES: flush with copious amounts of water for at least 15 min.
- 5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm
- 5 5 **Short-Term Inhalation Limits:** 1 ppm for 5 min
- 5 6 **Toxicity by Ingestion:** Not pertinent, ingestion unlikely (chlorine is a gas above −34.5°C)
- 5 7 **Late Toxicity:** None
- 5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure
- 5 10 **Odor Threshold:** 3.5 ppm

6 FIRE HAZARDS

- 6 1 **Flash Point:** Not flammable
- 6 2 **Flammable Limits in Air:** Not flammable
- 6 3 **Fire Extinguishing Agents:** Not pertinent
- 6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
- 6 5 **Special Hazards of Combustion Products:** Toxic products are generated when combustibles burn in chlorine
- 6 6 **Behavior in Fire:** Most combustibles will burn in chlorine although gas is not flammable
- 6 7 **Ignition Temperature.** Not flammable
- 6 8 **Electrical Hazard.** Data not available
- 6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

- 7 1 **Reactivity with Water:** Forms a corrosive solution
- 7 2 **Reactivity with Common Materials:** Reacts vigorously with most metals at high temperature. Copper may burn spontaneously
- 7 3 **Stability During Transport:** Stable
- 7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7 5 **Polymerization:** Not pertinent
- 7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8 1 **Aquatic Toxicity:** 0.05 ppm 96 Hr trout TLm fresh water; 10 ppm 1 hr tunicates killed salt water
- 8 2 **Waterfowl Toxicity:** Data not available
- 8 3 **Biological Oxygen Demand (BOD):** None
- 8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Diamond Shamrock Corp.
   Electro Chemicals Division
   Deer Park, Texas 77536
2. Dow Chemical Co.
   Midland, Mich. 48640
3. PPG Industries Inc.
   Industrial Chemicals Division
   Barberton, Ohio 44203

10 SHIPPING INFORMATION

- 10 1 **Grades of Purity:** Research purity, ultra high purity, high purity
- 10 2 **Storage Temperature:** Ambient
- 10 3 **Inert Atmosphere:** No requirement
- 10 4 **Venting:** Safety relief (300 psig)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C 1 J

12 HAZARD CLASSIFICATIONS

- 12 1 **Code of Federal Regulations:** Nonflammable compressed gas
- 12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	2
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	1
Self Reaction	0

- 12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13 1 **Physical State at 15°C and 1 atm:** Gas
- 13 2 **Molecular Weight:** 70.91
- 13 3 **Boiling Point at 1 atm.**
  −29.4°F = −34.1°C = 239.1°K
- 13 4 **Freezing Point:**
  −150°F = −101°C = 172°K
- 13 5 **Critical Temperature:**
  291°F = 144°C = 417°K
- 13 6 **Critical Pressure:**
  1118 psia = 76.05 atm = 7.708 MN/m²
- 13 7 **Specific Gravity:** 1.424 at 15°C (liquid)
- 13 8 **Liquid Surface Tension:**
  26.55 dynes/cm at −35.3°C
- 13 9 **Liquid-Water Interfacial Tension:** Not pertinent
- 13 10 **Vapor (Gas) Specific Gravity:** 2.4
- 13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.329
- 13 12 **Latent Heat of Vaporization**
  124 btu/lb = 68.7 cal/g = 2.87 × 10⁵ J/kg
- 13 13 **Heat of Combustion.** Not pertinent
- 13 14 **Heat of Decomposition.** Not pertinent
- 13 15 **Heat of Solution:** Not pertinent
- 13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

CTF — CHLORINE TRIFLUORIDE

Common Synonyms

Liquefied compressed gas | Greenish yellow liquid or colorless gas | Strong sweetish odor

Sinks and may boil in water. Reacts violently with water to produce poisonous gas. Boiling point is 53° F.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Evacuate area in case of large discharge.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
May explode on contact with combustibles.
POISONOUS GASES ARE PRODUCED WHEN HEATED
Containers may explode in fire
Wear chemical protective suit with self-contained breathing apparatus.
Combat fires from safe distance or protected location.
Extinguish with dry chemicals, carbon dioxide.
DO NOT USE WATER OR FOAMS. AVOID CONTACT WITH WATER.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to skin, eyes, nose and throat
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
DO NOT RUB AFFECTED AREAS.
IF IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED, do not induce VOMITING. Give water to drink, milk or milk of magnesia.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison air contaminant; water contaminant; corrosive; oxidizing material.
Restrict access.
Evacuate area.

2. LABELS





3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** CTF
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** ClF_3
3 4 **IMCO/United Nations Numerical Designation:** 2/1749

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied compressed gas
4 2 **Color:** Gas: colorless. Liquid: greenish yellow
4 3 **Odor:** Acrid, strong, pungent, sweetish, sweet and irritating

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Neoprene gloves and protective clothing made of glass fiber and Teflon, including full hood, self-contained breathing apparatus with full face mask.

5 2 **Symptoms Following Exposure:** Inhalation causes extreme irritation. Respiratory tract pulmonary edema may result. Vapors are very irritating to eyes and skin. Liquid causes severe burns.

5 3 **Treatment for Exposure.** Call physician at once after any exposure to this compound. INHALATION: remove victim to fresh air and *keep him quiet*; give artificial respiration if breathing has stopped; give oxygen; enforce rest for 24 hours. EYES: flush with water for at least 15 min.; get medical attention. But do not interrupt flushing for at least 10 min. SKIN: flush with water, then with 3% aqueous ammonia, then again with water; apply ice cold pack of saturated Epsom salt or 70% ethyl alcohol.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm (ceiling limit)

5 5 **Short-Term Inhalation Limits:** 0.1 ppm for 5 min

5 6 **Toxicity by Ingestion:** Grade 4. LD_{50} < 50 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations.

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant, causes second- and third-degree burns on short contact and is very injurious to the eyes.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable, but may cause fire on contact with some materials.
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires unless well protected against hydrogen fluoride gas.
6 5 **Special Hazards of Combustion Products:** If released from container, fumes are toxic and irritating.
6 6 **Behavior in Fire.** If released from container can increase the intensity of fire. Containers may explode.
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts explosively with water, evolving hydrogen fluoride, (hydrofluoric acid) and chlorine.
7 2 **Reactivity with Common Materials.** Causes ignition of all combustible materials and even sand or concrete. Very similar to fluorine gas.
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Flood with water.
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available.
8 2 **Waterfowl Toxicity:** Data not available.
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Matheson Gas Products Co.
East Rutherford, N. J. 07073

2 Air Products and Chemicals, Inc.
Specialty Gases Department
P. O. Box 538
Allentown, Pa. 18105

3 Union Carbide Corp.
Linde Division
270 Park Avenue
New York, N. Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A C O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizer
12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas
13 2 **Molecular Weight:** 92.5
13 3 **Boiling Point at 1 atm.**
53°F = 11.6°C = 284.8°K
13 4 **Freezing Point:**
−105°F = −76.1°C = 197.1°K
13 5 **Critical Temperature.**
307°F = 153°C = 426°K
13 6 **Critical Pressure:**
837 psia = 56.9 atm = 5.77 MN/m²
13 7 **Specific Gravity:** 1.88 at 11°C (liquid)
13 8 **Liquid Surface Tension:**
26.6 dynes/cm = 0.0266 N/m at 0°C
13 9 **Liquid-Water Interfacial Tension.**
Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 3.2
13 11 **Ratio of Specific Heats of Vapor (Gas):**
1.2832
13 12 **Latent Heat of Vaporization:** 128 Btu/lb = 71.2 cal/g = 2.98 × 10⁵ J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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CHLOROACETOPHENONE

Common Synonyms

Phenacyl chloride
omega-Chloroacetophenone
alpha-Chloroacetophenone
Phenyl chloromethyl ketone
Chloromethyl phenyl ketone
Tear gas

Solid | White to light yellow | Sharp odor

Sinks in water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - air contaminant
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Phenacyl chloride omega Chloroacetophenone, alpha Chloroacetophenone Phenyl chloromethyl ketone Tear gas Chloromethyl phenyl ketone

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_6H_5COCH_2Cl$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1697

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to pale yellow

4 3 **Odor:** Pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Full face organic canister mask, self-contained breathing apparatus rubber gloves protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes tearing burning of the eyes and difficulty in breathing, high concentrations may lead to development of acute pulmonary edema after latencies of 8 hrs to several days, possible systemic manifestations include agitation, coma, contraction of pupils of eyes loss of reflexes External contact causes irritation of skin and intense irritation of eyes Ingestion causes agitation, coma contraction of pupils of eye loss of reflexes

5 3 **Treatment for Exposure:** INHALATION remove victim from contaminated atmosphere at once give artificial respiration and oxygen if necessary watch for pulmonary edema for several days EYES flush with water do not rub SKIN flush with water INGESTION get medical attention watch for development of pulmonary edema for several days

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 05 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 52 mg/kg (rat)

5 7 **Late Toxicity:** Fatty infiltration of liver

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** 0 016 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** Combustible solid 244°F C C (solutions only)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride may form

6 6 **Behavior in Fire:** Unburned material may become volatile and cause severe eye irritation

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly generating hydrogen chloride The reaction is not hazardous

7 2 **Reactivity with Common Materials:** Reacts slowly with metals causing mild corrosion

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Federal Laboratories Inc
Saltsburg Pa 15681

2 Pfaltz and Bauer Inc
126-64 Northern Boulevard
Flushing N Y 11368

3 MC B Manufacturing Chemists
2909 Highland Avenue
Norwood Ohio 45212

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Sometimes shipped as a solution in an organic solvent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

H RR

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Irritant

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 154 6

13 3 **Boiling Point at 1 atm:** 472°F = 247°C = 520°K

13 4 **Freezing Point:** 68 138°F = 26 59°C = 293 332°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 32 at 15°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est) = 9 340 Btu lb = −5 170 cal/g = −217 × 10⁷ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CAC CHLOROACETYL CHLORIDE

Common Synonyms

Liquid | Colorless to light yellow | Sharp extremely irritating odor

Reacts violently with water Irritating vapor is produced

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
DO NOT USE WATER ON ADJACENT FIRES

Exposure

VAPOR
Irritating to eyes nose and throat

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning air contaminant corrosive
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Chloracetyl chloride
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** ClCH2COCl
3 4 **IMCO/United Nations Numerical Designation:** 8 1752

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless to slightly yellow
4 3 **Odor:** Sharp pungent, extremely irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Acid type canister mask self-contained breathing apparatus (full faced) rubber gloves and full protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory system External contact causes severe irritation of eyes and skin Ingestion causes severe irritation of mouth and stomach

5 3 **Treatment for Exposure:** INHALATION remove from exposure support respiration call physician EYES wash with copious amounts of water for 15 min call physician SKIN wash with large amounts of water treat burns as required INGESTION do NOT induce vomiting give large amounts of water call a physician

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third-degree burns on short contact and is very injurious to the eyes

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires
6 5 **Special Hazards of Combustion Products:** Heat of fire can cause decomposition with evolution of highly toxic and irritating hydrogen chloride and phosgene vapors
6 6 **Behavior in Fire:** Highly irritating tear gas vapors released when heated Hydrogen chloride gas is released if in contact with water
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously to generate hydrogen chloride (hydrochloric acid)
7 2 **Reactivity with Common Materials:** Will react with surface moisture to generate hydrogen chloride which is corrosive to metals
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water rinse with sodium bicarbonate or lime solution
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640

2 White Chemical Corp
P O Box 278
Bayonne, N J 07002

3 Eastman Kodak Co
Eastman Organic Chemicals
Rochester, N Y 14650

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive liquid

*12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	3
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 112.9
13 3 **Boiling Point at 1 atm:** 221°F = 105°C = 378°K
13 4 **Freezing Point:** −8.5°F = −22.5°C = 250.7°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** 1423 at 20°C (liquid)
13 7 **Specific Gravity:** 1.42 at 20°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 3.9
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.1191
13 12 **Latent Heat of Vaporization:** 166 Btu/lb = 92.0 cal/g = 3.85 × 10⁵ J/kg
13 13 **Heat of Combustion:** (est.) −4,000 Btu/lb = −2,000 cal/g = −90 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** (est.) −54 Btu/lb = −30 cal/g = −1.3 × 10⁵ J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CAP

p-CHLOROANILINE

Common Synonyms

1 Amino-4-chlorobenzene
4-Chlorophenylamine
4-Chloroaniline

Solid — Yellowish white — Mild sweet odor

Sinks and mixes slowly with water

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

SOLID AND DUST
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Amino-4-chlorobenzene
4 Chlorophenylamine
4 Chloroaniline

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $4\text{-}ClC_6H_4NH_2$

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1526

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellowish white cream to tan color (darkens on storage)

4 3 **Odor:** Slightly sweetish characteristic amine

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, chemical goggles, protective clothing, dust respirator

5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes bluish tint to fingernails, lips and ears indicative of cyanosis, headache, drowsiness and nausea, followed by unconsciousness. Liquid can be absorbed through skin and cause similar symptoms. Contact with eyes causes irritation.

5 3 **Treatment for Exposure:** INHALATION: remove victim from exposure immediately, if needed administer oxygen, refer to physician. EYES: flush with water for at least 15 min. SKIN: remove victim from exposure immediately, remove contaminated clothing, wash contacted area with copious amounts of water and soap, if needed, administer oxygen, refer to physician. INGESTION: induce vomiting, get medical attention.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 300 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** (Combustible solid) > 220°F O C

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, dry chemical, foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and oxides of nitrogen may form in fires

6 6 **Behavior in Fire:** Data not available

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** Data not available

9. SELECTED MANUFACTURERS

1 Monsanto Company
Monsanto Industrial Chemicals
800 North Lindbergh Boulevard
St. Louis, Mo. 63166

2 E. I. duPont de Nemours & Co.
Organic Chemicals Department
Dyes and Chemicals Division
Wilmington, Del. 19898

3 Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** 99.0% Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester). Store containers in a well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 127.6

13 3 **Boiling Point at 1 atm:** 446°F = 230°C = 503°K

13 4 **Freezing Point:** 158.1°F = 70°C = 343°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.43 at 19°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** (est.) = -13,000 Btu/lb = -6,000 cal/g = -250 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CRB CHLOROBENZENE

Common Synonyms
Monochlorobenzene
Phenyl chloride
Benzene chloride

Watery liquid. Colorless. Sweet, almond odor.

Sinks. Flammable vapor is produced.

Avoid contact with liquid and vapor. Keep people away.
Stop discharge if possible.
Call fire department.
Keep upwind. Use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

VAPOR
If inhaled, will cause coughing or dizziness.
Not irritating to eyes, nose and throat.

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

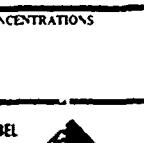
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Should be removed.
Chemical and mechanical treatment.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Benzene chloride
MCB
Monochlorobenzene
Phenyl chloride

3.2 **Coast Guard Compatibility Classification:**
Halogenated hydrocarbon

3.3 **Chemical Formula:** C_6H_5Cl

3.4 **IMCO United Nations Numerical Designation:** 1134

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild amine odor, sweet, almond like aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor mask and safety goggles where appropriate. In presence of high vapor concentrations, self-contained breathing apparatus. Chemical safety goggles or face shield. Wear appropriate rubber surface apron or impervious clothing to splash protection hazard.

5.2 **Symptoms Following Exposure:** Irritating to skin, eyes and mucous membranes. Repeated exposure may cause dermatitis due to defatting action. Overexposure by inhalation of vapors may cause eye damage, lung injury, unconsciousness. Acute vapor overexposure can cause symptoms ranging from coughing, nausea, headaches and central nervous system depression.

5.3 **Treatment for Exposure:** Get medical attention for any exposure and advise physician of exposure. Treat decomposition products as indicated. INHALATION: remove to fresh air, apply artificial respiration if needed. INGESTION: dilute by drinking water, if vomiting occurs, administer more water. Administer saline cathartic. EYES: flush thoroughly with water. SKIN: remove contaminated clothing, wash exposed area with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 75 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD_{50} 0.5-5 g/kg (rabbits)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to eyes and throat.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.21 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 84°F C.C., 97°F O.C.

6.2 **Flammable Limits in Air:**
1.3% - 7.1%

6.3 **Fire Extinguishing Agents:**
Carbon dioxide, dry chemical, foam or water spray.

6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent.

6.5 **Special Hazards of Combustion Products:**
Burning in open flame can form toxic phosgene and hydrogen chloride gases.

6.6 **Behavior in Fire:** Vapor can travel a considerable distance to a source of ignition and flash back.

6.7 **Ignition Temperature:** 1184°F

6.8 **Electrical Hazard.** Data not available.

6.9 **Burning Rate:** (est.) 4.6 mm/min.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.

7.2 **Reactivity with Common Materials:**
No reaction.

7.3 **Stability During Transport:** Stable.

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization:**
Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
20 ppm/96 hr/bluegill/TL$_m$/fresh water

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD):**
0.38 lb/lb/5 days

8.4 **Food Chain Concentration Potential.**
Data not available.

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640

2. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

3. Montrose Chemical Corp.
900 South Virgil Ave.
Los Angeles, Calif. 90005

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 99.9% technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement.

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

NFS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 112.56

13.3 **Boiling Point at 1 atm:**
270°F = 132°C = 405°K

13.4 **Freezing Point:**
-0.1°F = -49.6°C = 223.6°K

13.5 **Critical Temperature:**
679°F = 359°C = 632°K

13.6 **Critical Pressure:**
656 psia = 44.6 atm = 4.52 MN/m^2

13.7 **Specific Gravity:** 1.11 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
33 dynes/cm = 0.033 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:**
35 dynes/cm = 0.035 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent.

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.068

13.12 **Latent Heat of Vaporization**
155 Btu/lb = 86 cal/g = 1.40 x 10^5 J/kg

13.13 **Heat of Combustion.** (est.) 12 000 Btu/lb = 6 700 cal/g = 280 x 10^5 J/kg

13.14 **Heat of Decomposition.** Not pertinent.

13.15 **Heat of Solution:** Not pertinent.

13.16 **Heat of Polymerization.** Not pertinent.

(Continued on page 5-CRB)

NOTES

REVISED 1978

CBN	4-CHLOROBUTYRONITRILE

Common Synonyms		
4-Chlorobutyronitrile	Liquid	White to light yellow
	Sinks in water	

[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated
[illegible]

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]
LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-2)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 4-Chlorobutyronitrile (Practical, mixture with 4-bromobutyronitrile)
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $CH_2ClCH_2CH_2CN$ + $CH_2BrCH_2CH_2CN$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** White to pale yellow
4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air supply mask or self-contained breathing apparatus for repeated handling large amounts rubber gloves safety goggles
5 2 **Symptoms Following Exposure:** Chemical is moderately toxic Inhalation causes irritation of nose and throat Ingestion causes irritation of mouth and stomach Contact with eyes causes irritation Can penetrate the skin on prolonged contact only slightly irritating
5 3 **Treatment for Exposure:** INHALATION move victim to fresh air, administer artificial respiration if required call a doctor INGESTION give large amount of water induce vomiting EYES flush with water for at least 15 min SKIN flush with plenty of water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3, LD50 400 mg/kg (rat)
5 7 **Lcso Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Water dry chemical foam carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:**
6 5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen cyanide hydrogen bromide and hydrogen chloride may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Eastman Kodak Co
343 State St
Rochester N [illegible] 14650

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** 50% + 40% 4-bromobutyronitrile + 8% glutaronitrile Major components have same hazard ratings
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 103 55
13 3 **Boiling Point at 1 atm:** 374°F = 190°C = 463°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 22 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** 3 57
13 11 **Ratio of Specific Heats of Vapor (Gas):** (est) 1 080 at 20°C
13 12 **Latent Heat of Vaporization:** (est) 185 Btu/lb = 103 cal/g = 4 31 × 10 J/kg
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CRF

CHLOROFORM

Common Synonyms
Trichloromethane

Watery liquid | Colorless | Sweet odor

Sinks in water. Irritating vapor is produced.

Fire

Not flammable.
POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause headache, nausea, dizziness or loss of consciousness.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Isolate warning area until atmosphere is safe for re-entry.
Restrict access.
Shut off ignition sources.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichloromethane
3.2 **Coast Guard Compatibility Classification:** Halogenated compound
3.3 **Chemical Formula:** $CHCl_3$
3.4 **IMCO United Nations Numerical Designation:** 9.0 [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pleasant, sweet, ether-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles; [illegible]. Where [illegible] suitable self-contained breathing system.
5.2 **Symptoms Following Exposure:** Headache, nausea, dizziness, drowsiness, narcosis.
5.3 **Treatment for Exposure:** INHALATION: [illegible] and administer oxygen. If breathing has stopped, [illegible] and give artificial respiration. If not breathing, give artificial respiration. INGESTION: Induce vomiting and get medical attention. Do not induce vomiting or give anything by mouth to an unconscious person. EYES: Flush with plenty of water for at least 15 minutes and get medical attention. SKIN: Wash with soap and water. Remove contaminated clothing and shoes.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm for 10-hour work day
5.5 **Short-Term Inhalation Limits:** 50 ppm for 10 min
5.6 **Toxicity by Ingestion:** Grade 2 LD[illegible] 2 g/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes moderate [illegible] with [illegible] exposure. High concentrations cause pulmonary edema. Death is [illegible].
5.9 **Liquid or Solid Irritant Characteristics:** Minimum [illegible] Drops [illegible] reddening and blistering of the skin. Prolonged contact may cause [illegible] and reddening of the skin.
5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Poisonous and irritating gases are produced when heated.
6.6 **Behavior in Fire:** Decomposes [illegible]
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** None
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Allied Chemical Corp.
Specialty Chemicals Division
Morristown, New Jersey 07960

2. Dow Chemical Co.
Midland, Michigan 48640

3. Stauffer Chemical Co.
Industrial Chemicals Division
[illegible]

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical, USP
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3.

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 119.39
13.3 **Boiling Point at 1 atm:** 142 F = 61 C = 334 K
13.4 **Freezing Point:** -82 F = -63 C = 210 K
13.5 **Critical Temperature:** 503 F = 262 C = 535 K
13.6 **Critical Pressure:** 794 psia = 54 atm = 5.5 MN/m²
13.7 **Specific Gravity:** 1.49 at 20 C (liquid)
13.8 **Liquid Surface Tension:** 28 dynes/cm = 0.028 N/m at 20 C
13.9 **Liquid-Water Interfacial Tension:** 62 dynes/cm = 0.062 N/m at 20 C
13.10 **Vapor (Gas) Specific Gravity:** 4.1
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.134
13.12 **Latent Heat of Vaporization:** 105.3 Btu/lb = 59 cal/gm = 247 kJ/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** None known
13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

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CHD	# CHLOROHYDRINS (CRUDE)

Common Synonyms
Crude epichlorohydrin

Watery liquid | Colorless to yellow | Garlic odor

Sinks and mixes with water. Poisonous vapor is produced.

Fire

Combustible
Containers may explode in fire
Poisonous gases are produced in fire

Exposure

VAPOR
Poisonous if inhaled
Irritating to eyes, nose and throat

LIQUID
Poisonous if swallowed
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

Rescue
Dilute and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Crude epichlorohydrin

3.2 **Coast Guard Compatibility Classification:**
Special class

3.3 **Chemical Formula:**
C_3H_5OCl ($ClCH_2CHOCH_2$)

3.4 **IMCO United Nations Numerical Designation:** No. 2023

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Yellow

4.3 **Odor:** Pungent. Slight garlic odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor mask or air line respirator. Protective gloves.

5.2 **Symptoms Following Exposure:** May cause central nervous system depression. Vapor irritating to eyes, nose and throat. Headache, nausea, vomiting, unconsciousness, impaired vision, coma.

5.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Induce vomiting immediately as directed by physician. DO NOT induce vomiting or give anything by mouth to an unconscious person. EYES: Wash with plenty of water for at least 15 minutes and get medical attention. SKIN: Remove contaminated clothing and wash before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits:** 50 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 4: Probably fatal dose

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes moderate irritation of eyes, which persists a short time after exposure. Highly irritating to eyes at high concentration. Unpleasant. Threshold 10 ppm.

5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. Liquid can cause burning and stinging pain. May cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.5 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 92°F (33°C) (TOC)

6.2 **Flammable Limits in Air:**
Not reported

6.3 **Fire Extinguishing Agents:** Water spray, dry chemical or foam. Do not use water jet.

6.4 **Fire Extinguishing Agents Not to be Used:** Water jet. Do not use water jet.

6.5 **Special Hazards of Combustion Products:** Irritating and poisonous gases are produced when heated.

6.6 **Behavior in Fire:** Containers may explode in heat because of pressure rise.

6.7 **Ignition Temperature:** 448°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 2.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Mild reaction. Reaction is not hazardous.

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Can polymerize in presence of strong acid and bases particularly when heated

7.6 **Inhibitor of Polymerization:** None

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

2. Shell Chemical Co.
Industrial Chemicals Dept.
Houston, Texas 77001

Union Carbide Corp.
Chemicals and Plastics Dept.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical grade. Contains 90% epichlorohydrin. The balance being water, dichloropropanols, chloroethers, dichloropropanes, dichloropropenes and other chlorinated hydrocarbons.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG-446-2)

ATLAS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Poison Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	2

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.18 at 20°C/4°C

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** (est.) 142 Btu/lb = 78.9 cal/g = 3.30 × 10⁵ J/kg

13.13 **Heat of Combustion:** -14,000 Btu/lb = -7780 cal/g = -325 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 2

NOTES

REVISED 1978

CME CHLOROMETHYL METHYL ETHER

Common Synonyms

Monochloromethyl ether
Methyl chloromethyl ether
α-chloroether

Liquid | Colorless | Irritating odor

May float or sink in water. Poisonous, flammable vapor is produced.

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Poisonous to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning; poison, high flammability, air contaminant, corrosive
Restrict access
Evacuate area

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Monochloromethyl ether, Methyl chloromethyl ether, α-chloroether
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** CH_3OCH_2Cl
3.4 **IMCO/United Nations Numerical Designation:** 1.1 (2.3)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Irritating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, goggles, rubber gloves, protective clothing
5.2 **Symptoms Following Exposure:** Inhalation causes sore throat, sneezing, chills, difficulty in breathing. Contact of liquid with eyes causes severe burns and severe vapor is a powerful tear gas. Skin contact causes severe burns and necrosis. Ingestion causes severe burns of mouth and stomach.
5.3 **Treatment for Exposure:** INHALATION: remove from exposure, support respiration, call physician. EYES: wash with copious quantities of water for at least 15 min., call physician. SKIN: wash with large amounts of water. INGESTION: Do NOT induce vomiting, give large amounts of water, call a physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 457 mg/kg (rats)
5.7 **Late Toxicity:** Considered to be a lung cancer producing
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Earth severe skin irritant. May cause pain and second degree burns after a few minutes contact.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 0°F (-18°C)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene gases may be formed
6.6 **Behavior in Fire:** Unburned material may form powerful tear gas. When wet, also forms irritating formaldehyde gas.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to produce formaldehyde and hydrogen chloride. The reaction is not violent.
7.2 **Reactivity with Common Materials:** Will react with surface moisture to produce hydrogen chloride which is corrosive to metal.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water. Rinse with sodium bicarbonate and lime solution.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

2. Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vent

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

NOTE WAY

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 80.5
13.3 **Boiling Point at 1 atm:** 140°F = 60°C = 333°K
13.4 **Freezing Point:** -[illegible]°F = -[illegible]°C = [illegible]°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.07 at 25°C (liquid)
13.8 **Liquid Surface Tension:** [illegible] dynes/cm = 0.030 N/m at 25°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1195
13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg
13.13 **Heat of Combustion:** [illegible] Btu/lb = -[illegible] cal/g = -[illegible] J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 2

NOTES

CPN	p-CHLOROPHENOL

Common Synonyms			
4-Chlorophenol	Solid	White to straw	Medicinal odor
	Sinks in water		

Avoid contact with solid and dust. Keep people away.
Wear rubber overclothing including gloves.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Irritating gases may be produced when heated.
Wear goggles and self-contained breathing apparatus.
Extinguish with water, dry chemicals, foam or carbon dioxide.

Exposure

CALL FOR MEDICAL AID.

DUST
Irritating to eyes, nose and throat.
If inhaled will cause headache or dizziness.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Will burn skin and eyes.
If swallowed will cause nausea and vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning: water contaminant
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 4 Chlorophenol
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** C_6H_5ClO
3 4 **IMCO/United Nations Numerical Designation.** 6 1/2020

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Colorless to straw
4 3 **Odor:** Strong medicinal

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, face shield, boots and apron, respiratory protection
5 2 **Symptoms Following Exposure.** Inhalation causes headache, dizziness, weak pulse. Ingestion causes irritation of mouth and stomach, headache, dizziness, weak pulse. Contact with eyes causes severe irritation and burning. Contact with skin causes irritation and burn if absorbed causes same symptoms as inhalation.
5 3 **Treatment for Exposure:** INHALATION: move to fresh air, get medical attention if any symptoms develop. INGESTION: do not induce vomiting unless advised by a physician, give large amounts of milk, egg whites, or water and get medical help immediately, no specific antidote known. EYES: immediately flush with plenty of water for at least 30 min. SKIN: flush in safety shower while removing all contaminated clothing, wash with soap and water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 500 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** 30 ppm

6. FIRE HAZARDS

6 1 **Flash Point:** 250°F CC
6 2 **Flammable Limits in Air:** Not pertinent (combustible solid)
6 3 **Fire Extinguishing Agents.** Water, foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:**
6 5 **Special Hazards of Combustion Products.** Toxic and irritating hydrogen chloride and chlorine gases may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.7 ppm/96 hr/crab/lethal range/sea water
0.4 ppm/96 hr/crab/safe range/sea water
14 ppm/24 hr/minnow/TL_m/fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 The Dow Chemical Co
2030 Dow Center
Midland, Mich 48640

2 Progil Inc
509 Madison Avenue
New York, N Y 10022

3 Monsanto Company
800 North Lindbergh Blvd
St Louis, Mo 63166

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure, 99%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

HSS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 128.6
13 3 **Boiling Point at 1 atm.** 428°F = 220°C = 493°K
13 4 **Freezing Point:** 109°F = 43°C = 316°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.31 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** (est.) 160 Btu/lb = 89 cal/g = 3.7 × 10^5 J/kg
13 13 **Heat of Combustion.** −9,330 Btu/lb = −5,180 cal/g = −217 × 10^5 J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

CPL CHLOROPICRIN, LIQUID

Common Synonyms

Trichloronitromethane
Nitrochloroform
Picfume
Nitro trichloromethane

Oily liquid | Colorless | Extremely irritating odor

Sinks in water. Poisonous vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES ARE PRODUCED IN FIRE.
Containers may explode in fire.
Wear chemical protective suit with self-contained breathing apparatus.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR

POISONOUS IF INHALED.
Irritating to eyes, nose and throat.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Will burn skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-448-4)

Issue warning: poison, water contaminant, air contaminant.
Restrict access to area.
Should be removed.
Chemical and physical treatment.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichloronitromethane; Nitrochloroform; Picfume; Nitrotrichloromethane

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CCl_3NO_2

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1580

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Intensely irritating lachrymator; intense and penetrating odor which causes a pronounced secretion of tears

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic type canister mask; goggles or face shield; rubber gloves; protective cloth. g

5.2 **Symptoms Following Exposure.** Inhalation causes nausea, eye watering, vomiting, bronchitis and pulmonary edema. Vapor is a powerful tear gas. Liquid irritates and burns skin and causes severe burns of eyes. Ingestion causes severe irritation of mouth and stomach.

5.3 **Treatment for Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove from exposure, support respiration. EYES: flush with copious quantities of water for at least 15 min. SKIN: wash with water for 15 min. INGESTION: do NOT induce vomiting, give large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} = 250 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5.10 **Odor Threshold.** 1.1 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Cool exposed containers with water.

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire.** Compound forms a powerful tear gas when heated. Heated material may detonate under fire conditions.

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Great Lakes Chemical Corporation
P. O. Box 2200
West Lafayette, Ind. 47996

2 Dow Chemical Co.
Midland, Mich. 48640

3 Sobin Chemicals, Inc.
Sobin Park
Boston, Mass. 02210

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

V X

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisonous, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	4
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	3

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 164.4

13.3 **Boiling Point at 1 atm.** 234°F = 112°C = 385°K

13.4 **Freezing Point:** −83°F = −64°C = 209°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.64 at 25°C (liquid)

13.8 **Liquid Surface Tension.** 32.3 dynes/cm = 0.0323 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 5.7

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.0991

13.12 **Latent Heat of Vaporization:** 103 Btu/lb = 57.3 cal/g = 2.4 × 10⁵ J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

CSA

CHLOROSULFONIC ACID

Common Synonyms
Chlorsulfonic acid

Liquid Colorless to light yellow Sharp, choking odor

Reacts violently with water
Appears to explode
Poisonous gas is produced

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber clothing.
Stay upwind.
Notify local fire department.
Notify local health authorities.

Fire

May cause fire on contact with combustibles
Flammable, explosive gases may be formed on contact with metals and moisture
DO NOT USE WATER
Use dry chemicals or carbon dioxide.
Wear goggles, self-contained breathing apparatus, rubber clothing, rubber gloves.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose, and throat
Harmful if inhaled
Move to fresh air.
If victim has stopped breathing, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: air contaminant
corrosive
Restrict access
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chlorsulfonic acid
3.2 **Coast Guard Compatibility Classification.** Inorganic acids
3.3 **Chemical Formula.** $ClSO_3H$
3.4 **IMCO/United Nations Numerical Designation** NO 1754

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color.** Colorless to pale yellow
4.3 **Odor:** Sharp acrid penetrating pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Acid proof goggles or rubber hood, long rubber gloves, rubber shoes, long rubber apron, shirt and trousers of wool or acrylic fiber, and chin with, brim. For emergencies use involving considerable exposure, a complete rubber suit with hood, gloves and boots of rubber should be used. In case of fire use self-contained breathing apparatus.

5.2 **Symptoms Following Exposure.** INHALATION: vapor extremely irritating to lungs and mucous membranes. Vapor has such a sharp and penetrating odor that inhalation of severely toxic quantities is unlikely unless it is impossible to escape the fumes. CONTACT WITH EYES OR SKIN: liquid acid will severely burn body tissue.

5.3 **Treatment for Exposure:** Call a physician in all cases. INHALATION: remove victim to fresh air if he is not breathing, apply artificial respiration, give oxygen if breathing is difficult, do NOT induce vomiting. SKIN: flush with plenty of water for at least 15 min. while removing contaminated clothing and shoes.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 1 ppm

5.5 **Short-Term Inhalation Limits:** 1 ppm for 5 min; 30 ppm for 10 min; 10 ppm for 60 min

5.6 **Toxicity by Ingestion** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Severe eye and throat irritant. Can cause eye or lung injury and cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact. Very injurious to the eyes.

5.10 **Odor Threshold:** 1.8 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Water
6.5 **Special Hazards of Combustion Products:** Decomposes into irritating and toxic gases
6.6 **Behavior in Fire:** Although nonflammable it may ignite other combustibles. Contact with water AND metal produces explosive hydrogen gas.
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently with water forming hydrochloric acid (vapor) and sulfuric acid
7.2 **Reactivity with Common Materials:** Hydrogen, a highly flammable and explosive gas is generated by the action of the acid on most metals. May cause ignition by contact with combustible materials.
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Although the acid reacts violently with water (fuming for a distance) must be carried out before neutralizing with lime, water or sodium bicarbonate solution.
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
282 ppm/96 hr mosquito fish / TL$_m$ / fresh water
100-300 ppm/48 hr shrimp / LC / salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Cities Service Co., Inc.
Industrial Chemicals Division
60 Wall St.
New York, N.Y. 10005
2. E. I. du Pont de Nemours & Co., Inc.
Industrial & Biochemicals Dept.
Wilmington, Del. 19898
3. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

VO

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
Special	W, OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 116.53
13.3 **Boiling Point at 1 atm:**
311°F = 155°C = 428°K
13.4 **Freezing Point:**
−112°F = −80°C = 193°K
13.5 **Critical Temperature.** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.75 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** (est.)
198 Btu/lb = 110 cal/g = 4.6 × 10^5 J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

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4-CHLORO-o-TOLUIDINE

Common Synonyms
2-Amino-5-chlorotoluene
5-Chloro-2-aminotoluene
4-Chloro-2-methylaniline
Fast Red TR base
Red TR base

Solid | Gray to white | Weak fishy odor

Sinks in water. Freezing point is 79° F.

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear goggles self-contained breathing apparatus and rubber protective clothing including gloves.
Call fire department.
Stay upwind. Use water spray to knock down dust.
Isolate and restrict unprotected material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Extinguish with water, dry chemical, foam, or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Move victim to fresh air.
If in eyes, hold eyelids apart and flush with plenty of water.
If breathing is difficult, give oxygen.

SOLID
POISONOUS IF SWALLOWED
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
If IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (milk or egg white if available) and induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify operators of nearby water intakes.
Notify public health officials and other authorities as required.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Amino-5-chlorotoluene; 5-Chloro-2-aminotoluene; 4-Chloro-2-methylaniline; Fast Red TR base; Red TR base
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $2\ CH_3\text{-}4\text{-}ClC_6H_3NH_2$
3.4 **IMCO/United Nations Numerical Designation:** 6.1/1579

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Grayish white
4.3 **Odor:** Weak fishy

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, goggles, rubber gloves, protective clothing
5.2 **Symptoms Following Exposure:** Inhalation, ingestion or skin contact causes blush tint in fingernails, lips and ears. Headache, drowsiness and nausea also occur. Contact with eyes causes irritation.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give oxygen if needed, get medical attention. EYES: flush with water for at least 15 min. SKIN: wash immediately with soap and water. INGESTION: induce vomiting, get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 464 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Combustible solid
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water, dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and hydrochloric acid fumes may form
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Pfister Chemical Inc
Linden Avenue
Ridgefield, N J 07657

2 E I duPont de Nemours & Co
Dyes and Chemicals Division
Wilmington, Del 19898

3 Blackman Uhler Chemical Co
P O Box 5627
Spartanburg, S C 29301

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classification:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 141.6
13.3 **Boiling Point at 1 atm:** 466°F = 241°C = 514°K
13.4 **Freezing Point:** 77°F = 25°C = 298°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** (est.) > 1.1 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CMA — CHROMIC ANHYDRIDE

Common Synonyms			
Chromic oxide Chromium trioxide Chromic acid	Solid flakes or powder Sinks and mixes with water	Dark red	Odorless

Avoid contact with solid and dust. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber overclothing including gloves.
Stay upwind and use water spray to knock down dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
May cause fire on contact with combustibles
Containers may explode when heated in a fire
Extinguish with water.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
SOLID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: water contaminant.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Chromic acid
Chromic oxide
Chromium trioxide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CrO_3

3.4 **IMCO United Nations Numerical Designation:** 8 / 1463

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Dark red

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles and respirator. Special chromic acid filters are available for respirators to prevent inhalation of dust or mist.

5.2 **Symptoms Following Exposure:** Very irritating to eyes and respiratory tract. Ingestion causes severe gastrointestinal symptoms. Contact with eyes or skin causes burns; prolonged contact produces dermatitis (chrome sores).

5.3 **Treatment for Exposure:** INGESTION: call a physician; DO NOT induce vomiting. SKIN OR EYES: wash eyes thoroughly for at least 15 min; flush contacted skin areas with water; remove contaminated clothing and wash before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent.

5.6 **Toxicity by Ingestion:** Grade 3; LD_{50} to 500 mg/kg

5.7 **Late Toxicity:** Lung cancer

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact. Very injurious to the eyes.

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** May ignite organic materials on contact

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May react with organic materials rapidly enough to generate sufficient heat to cause ignition. Prolonged contact, particularly on wood floors, may produce a fire hazard.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water; rinse with sodium bicarbonate solution.

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.01 ppm/48 hr daphnia TLm
52 ppm/96 hr goldfish died

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Industrial Chemicals Division
Morristown, N. J. 07960

2. Diamond Shamrock Corp.
Soda Products Division
Castle Haynes, N. C. 28429

3. Essex Chemical Corp.
Chemicals Division
Kearny, N. J. 07032

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** technical, technical flake 99.75%

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 100.01

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.70 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

CMC

CHROMYL CHLORIDE

Common Synonyms
Chromium (VI) dioxychloride
Chromium oxychloride

Liquid | Dark red | Unpleasant odor

Reacts violently with water. Irritating visible vapor cloud is produced.

Fire

Not flammable
May cause fire on contact with combustibles
Irritating gases are produced when heated
Containers may explode in fire
[illegible]
DO NOT USE WATER ON FIRE
[illegible]

Exposure

ALL FORMS OF ACID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
[illegible]

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
[illegible]
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, corrosive air contaminant, water contaminant, oxidizing substance
Restrict access
Evacuate area
Disperse and flush with care

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Chromium (VI) dioxychloride
Chromium oxychloride
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** CrO_2Cl_2
3 4 **IMCO/United Nations Numerical Designation:** 9/1758

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Dark red
4 3 **Odor:** Acrid

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus (full face), rubber gloves, protective clothing
5 2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory system. Contact with eyes or skin causes irritation and burning. Ingestion causes burning of mouth and stomach.
5 3 **Treatment for Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove from exposure, support respiration. EYES: flush with copious quantities of water for 15 min. SKIN: flush with water for 15 min. INGESTION: do NOT induce vomiting, give large amounts of water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4, LD_{50} < 50 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes.
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable but may cause fire on contact with combustible materials
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires unless fully protected against toxic fumes
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Vapors are very irritating to eyes and mucous membranes. May increase severity of fire
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently to form hydrogen chloride (hydrochloric acid) and chlorine gases and chromic acid
7 2 **Reactivity with Common Materials:** Will cause severe corrosion of common metals
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flood with water. Rinse with sodium bicarbonate or lime solution
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Gallard-Schlesinger Chemical Manufacturing Corp
584 Mineola Avenue
Carle Place, Long Island, N Y 11514
2 Ventron Corp., Alfa Products
P O Box 159
Beverly, Mass 01915
3 Research Organic/Inorganic Chemical Corp
11686 Sheldon Rd
Sun Valley, Calif 91352

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99.5+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive
12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	4
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 154.9
13 3 **Boiling Point at 1 atm:** 241°F = 116°C = 389°K
13 4 **Freezing Point:** −141.7°F = −96.5°C = 176.7°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.96 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 36.61 dynes/cm = 0.03661 N/m at 19°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 5.3
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.2832
13 12 **Latent Heat of Vaporization:** 113 Btu/lb = 62.6 cal/g = 2.62×10^5 J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** −279 Btu/lb = −155 cal/g = -6.48×10^5 J/kg
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

CIT — CITRIC ACID

Common Synonyms
beta Hydroxy-tricarboxylic acid
2 Hydroxy 1 2 3-propane-tricarboxylic acid
beta Hydroxytricarballylic acid

Solid | White | Odorless

Sinks and mixes with water

Fire

Combustible

Exposure

ALL FOR MEDICAL AID

DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2-Hydroxy-1 2,3 propane-tricarboxylic acid beta Hydroxytricarballylic acid beta Hydroxy-tricarboxylic acid

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** HOC(CH$_2$CO$_2$H)$_2$CO$_2$H

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat Contact with eyes causes irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air EYES flush immediately with physiological saline or water get medical care if irritation persists SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 oral LD_{50} = 1 7 g kg (rat)

5 7 **Late Toxicity:** Chronic effects in humans are unknown

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** 0 28-2.29 kg/m^3 (dust)

6 3 **Fire Extinguishing Agents.** Water foam dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:** Melts and decomposes The reaction is not hazardous

6 7 **Ignition Temperature:** 1,850°F (powder)

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** Will corrode copper zinc aluminum and their alloys

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 544 ppm/4 hr/goldfish/killed/fresh water 100 ppm/48 hr/shore crab/TL$_m$ salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 40% 5 days 60% 10 20 days

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pfizer Chemicals Division
235 E 42nd St
New York N Y 10017

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown, N J 07960

3 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 384
Jersey City N J 07303

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** USP Reagent Monohydrate grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 192 1

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 307°F = 153°C = 426°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 54 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** 4 066 Btu lb = 2220 cal g = 9 30 J kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

CBA

COBALT ACETATE

Common Synonyms
Cobalt acetate tetrahydrate
Cobaltous acetate
Cobalt^{II} acetate

Solid | Pink | Vinegar like odor

Sinks and mixes with water

Stop discharge if possible. Keep people away.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If in eyes, hold eyelids apart and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, give several cups of water. Induce vomiting and have victim lie down.
IF SWALLOWED and victim is NOT CONSCIOUS OR HAS CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cobalt (II) acetate, Cobalt acetate tetrahydrate, Cobaltous acetate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Co(C_2H_3O_2)_2 \cdot 4H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Pink
4 3 **Odor:** Slight acetic acid odor, vinegar like

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator, rubber gloves, goggles or face shield, protective clothing
5 2 **Symptoms Following Exposure:** Inhalation causes shortness of breath and coughing; permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes causes irritation. Contact with skin may cause dermatitis.
5 3 **Treatment for Exposure:** INHALATION: move to fresh air; if breathing has stopped, begin artificial respiration. INGESTION: give large amounts of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: wash with soap and water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m^3 (as cobalt)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3; LD_{50}: 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products.** Toxic cobalt oxide fumes may form in fire.
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** Bioconcentration of 200 - 1000 fold only under constant exposure. Not significant in spill conditions

9 SELECTED MANUFACTURERS

1 Mooney Chemicals Inc
2301 Scranton Road
Cleveland, Ohio 44113

2 The Harshaw Chemical Co
1945 E. 97th St
Cleveland, Ohio 44106

3 Mallinckrodt Chemical Works
222 Westside Avenue
P.O. Box 344
Jersey City, N.J. 07303

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, Reagent
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 448-3

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight.** 249.1
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** 268°F = 140°C = 413°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.71 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 5

NOTES

CBC COBALT CHLORIDE

Common Synonyms			
Cobaltous chloride hexahydrate Cobaltous chloride Cobaltous chloride dihydrate	Solid	Pink to red	Slight sharp odor
	Sinks and mixes with water		

N[illegible] Discharge if possible. Keep people away.
Avoid contact with liquid and solid.
Evacuate downwind for large spills.
Notify fire authorities and pollution control agencies.

Fire

Not flammable

Exposure

CALIFORNIA Division of MPS

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.
[illegible]

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning. Keep water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cobalt(II) chloride
Cobaltous chloride, Cobaltous chloride dihydrate, Cobaltous chloride hexahydrate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CoCl_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Pink to red

4.3 **Odor:** Very slight acrid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, side shield goggles. Bureau of Mines respirator, protective clothing

5.2 **Symptoms Following Exposure:** Inhalation causes respiratory disease, shortness of breath and coughing, permanent disability may occur. Ingestion causes pain, vomiting, and diarrhea. Contact causes irritation of eyes and may cause skin rash.

5.3 **Treatment for Exposure.** INHALATION: move victim to fresh air if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water, induce vomiting. EYES: flush with water at least 15 min., consult physician if irritation persists. SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³ as cobalt

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 LD$_{50}$ (rat) 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Toxic cobalt oxide fumes may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
1000 ppm 30–72 hr goldfish killed fresh (hard) water
10 ppm 168 hr goldfish killed fresh (soft) water
200 ppm * mummichogs no effect sea water
*Time period not specified

8.2 **Waterborne Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

(Continued on page 4)

9 SELECTED MANUFACTURERS

1. Mooney Chemicals Inc
2301 Scranton Rd
Cleveland OH 44113
2. The Harshaw Chemical Co
1945 East 97th St
Cleveland Ohio 44106
3. Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087 P
Morristown N J 07960

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous 100.1%
May also be shipped as dihydrate

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 237.9

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 1 h °F = 86°C = 359°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.924 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 22 Btu/lb
= 12 cal/g = 0.50 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

8 WATER POLLUTION (Cont'd.)

8.4 **Food Chain Concentration Potential:** Bioconcentration of 200–1000 fold only under constant exposure. Not significant in spill conditions

CON

COBALT NITRATE

Common Synonyms
Cobaltous nitrate
Cobalt(II) nitrate
Cobaltous nitrate hexahydrate

Solid | Red | Odorless

Sinks and mixes with water

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cobalt(II) nitrate, Cobaltous nitrate, Cobaltous nitrate hexahydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Co(NO_3)_2 \cdot 6H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Red

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bu Mines approved respirator, rubber gloves, safety goggles, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes shortness of breath and coughing; permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes or skin causes irritation.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air; if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water, induce vomiting, call a doctor. EYES: flush with water for at least 15 min. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4; LD$_{50}$ = 400 mg/kg (rabbit)

5 7 **Late Toxicity:** Causes malignant tumors in rabbits

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:** May increase the intensity of fire

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Contact with wood and paper may cause fire

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
10 ppm* stickleback lethal conc. limit, fresh water
15 ppm* 96 hr stickleback avg. survival time, fresh water
20 ppm* 96 hr stickleback avg. survival time, fresh water
*as cobalt

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

Continued on page 4

9 SELECTED MANUFACTURERS

1 Mooney Chemicals Inc
2301 Scranton Road
Cleveland, Ohio 44113

2 The Harshaw Chemical Co
1945 E 97th St
Cleveland, Ohio 44106

3 Allied Chemical Corp
Specialty Chemicals Div
P O Box 405R
Morristown, N J 07960

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical hexahydrate. May also be shipped as anhydrous salt

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	1
Flammability (Red)	0	0
Reactivity (Yellow)	0	0
	OXY	OXY

*First column refers to nonfire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 291.04

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 131°F = 55°C = 328°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.54 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 31 Btu/lb = 17 cal/g = 0.71 × 10^3 J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 3 and 4

8. WATER POLLUTION (Cont'd)

8 4 **Food Chain Concentration Potential:** Bioconcentration of 200 - 1000 fold only under constant exposure. Not significant in spill condition.

CBS

COBALT SULFATE

Common Synonyms

Cobaltous sulfate heptahydrate
Cobalt[II] sulfate
Bieberite

Solid | Rose pink | Odorless

Sinks and mixes with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Bieberite, Cobalt(II) sulfate, Cobaltous sulfate heptahydrate
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** $CoSO_4 \cdot 7H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color:** Rose pink
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Be sure approved respirator, goggles, protective gloves
5 2 **Symptoms Following Exposure:** Inhalation causes shortness of breath and coughing; permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION: move to fresh air; if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water, induce vomiting, call a doctor. EYES: flush with water for at least 15 min., consult a physician if irritation persists. SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0.1 mg/m³ (as cobalt)
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 3 LD50: 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic cobalt oxide fumes may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 10 ppm*/** stickleback lethal fresh water
*As cobalt
**Time period not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential:** Bioconcentration of 200 - 1000 fold, and under constant exposure. Not significant in spill conditions

9. SELECTED MANUFACTURERS

1 Mooney Chemicals Inc
2301 Scranton Road
Cleveland, Ohio 44113

2 The Harshaw Chemical Co
1945 E. 97th St
Cleveland, Ohio 44106

3 Mallinckrodt Chemical Works
223 Westside Ave
P. O. Box 384
Jersey City, N. J. 07303

10 SHIPPING INFORMATION

10 1 **Grades or Purity.** Technical reagent, may also be shipped as a monohydrate or hexahydrate
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

SN

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 281
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.948 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** 23 Btu/lb
= 13.3 cal/g = 0.555 kJ/g
13 16 **Heat of Polymerization.** Not pertinent

(Continued on next page)

NOTES

CLD COLLODION

Common Synonyms
Cellulose nitrate solution
Nitrocellulose solution
Pyroxylin solution
Box toe gum
Nitrocellulose gum

Thick liquid | Colorless | Ether-like odor

Floats on water. Flammable, irritating vapor is produced. Boiling point is around 94° F.

[illegible]

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause dizziness, difficult breathing, or loss of consciousness
[illegible]

LIQUID
Not harmful

Water Pollution

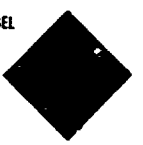
Effect of low concentrations on aquatic life is unknown
Foulers to shoreline
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

See Hazardous Materials Handbook CG 446-4

[illegible]
Remove sources
Mechanical containment
Should be covered
Chemical and physical treatment

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** [illegible]
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Viscous liquid
4.2 **Color:** [illegible]
4.3 **Odor:** Depends on solvent used; ether-like [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]
5.2 **Symptoms Following Exposure:** [illegible]
5.3 **Treatment of Exposure:** INHALATION [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]
5.5 **Short-Term Inhalation Limits:** [illegible]
5.6 **Toxicity by Ingestion:** [illegible]
5.7 **Late Toxicity:** [illegible]
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor may cause a slight smarting of the eyes or respiratory tract if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.
5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** −49°F (C.C. (ether)
6.2 **Flammable Limits in Air:** 1.9% - 48% (ether solution)
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** The formation of extremely toxic gases, notably oxides of nitrogen, hydrogen cyanide, and carbon monoxide is possible.
6.6 **Behavior in Fire:** Highly flammable solvent vapors are formed. May travel a long distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 356°F (ether)
6.8 **Electrical Hazard:** Class I, Group C
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Mallinckrodt Chemical Works, Second and Mallinckrodt Streets, St. Louis, Mo. 63160
2. [illegible] Inc., Fort Valley Industrial Park, Warrington, Pa. 18976

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** USP. All grades contain less than 60% nitrocellulose by weight.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Heat	
Vapor Irritants	
Liquid or Solid Irritants	0
Poisons	2
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	0 2
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

*Explanations given in [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** 94°F = 34°C = 307°K (ether solvent)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.772 at 25°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

COP COPPER ACETATE

Common Synonyms
Acetic acid cupric salt
Crystallized verdigris
Neutral verdigris
Cupric acetate monohydrate

Solid | Bluish-green | Odorless

Mixes with water

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.

SOLID
Will burn eyes
Irritating to eyes
If swallowed will cause nausea, vomiting or loss of consciousness.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic acid cupric salt, Crystallized verdigris, Cupric acetate monohydrate, Neutral verdigris
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $Cu(C_2H_3O_2)_2 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Bluish green
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of throat and lungs. Ingestion of large amounts causes violent vomiting and purging, intense pain, collapse, coma, convulsions, and paralysis. Contact with solutions irritates eyes, contact with solid causes severe eye surface injury and irritation of skin.
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min., get medical attention if injury was caused by solid. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 [illegible]
5.7 **Late Toxicity:** Causes degeneration of liver in dogs
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating vapors of acetic acid may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
General Chemical Div
40 Rector St
New York, N.Y. 10006
2. Union Carbide Corp
Chemicals and Plastics Div
270 Park Ave
New York, N.Y. 10017
3. J.T. Baker Chemical Co
Phillipsburg, N.J. 08865

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 98 - 99%
Reagent 99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 199.65
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 230°F = 110°C = 383°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.9 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 of 8

NOTES

CAA

COPPER ACETOARSENITE

Common Synonyms

Schweinfurth green
Imperial green
Paris green
Emerald green
Mets green

Solid Powder | Green | Odorless

Sinks and mixes slowly with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning: pure water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Imperial green, Vienna green, Paris green, King's green, Schweinfurth green, Meadow green, Mets green, Parrot green

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** [illegible]

3 4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Emerald green

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator, chemical safety goggles, rubber gloves

5 2 **Symptoms Following Exposure:** Data not available. Ingestion causes severe gastrointestinal irritation, muscular cramps and nervous system disorders which may lead to death.

5 3 **Treatment for Exposure:** Following ingestion, induce vomiting; administer dose of magnesium sulfate. Call doctor. Unable to induce vomiting, EYES: flush with copious amounts of water for 15 minutes. SKIN: wash thoroughly with soap and water. INGESTION: give copious drafts of water and induce repeated vomiting (see Antidote Chart, Emergency Care).

5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4; oral LD_{50} = 22 mg/kg (rats)

5 7 **Late Toxicity:** Arsenic poisoning

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Poisonous and irritating substances may be formed in fires

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** [illegible] ppm LC_{50}

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Los Angeles Chemical Company
2565 Alcazar Street
Los Angeles, Calif. 90039

2 Chemipar Chemical Co. Inc.
260 Madison Avenue
New York, N. Y. 10016

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

H SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poison B, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible] at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(continued on page 7 and 8)

NOTES

CPA — COPPER ARSENITE

Common Synonyms

Cupric arsenite
Swedish green
Cupric green
Copper orthoarsenite

Solid | Green | Odorless

Sinks in water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water
contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABEL

POISON

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** Cupric arsenite Swedish green Scheele's green Cupric green Copper orthoarsenite
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** $CuHAsO_3$
3 4 **IMCO/United Nations Numerical Designation** 6?, 1586

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color** Green, yellowish green
4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust respirator, rubber gloves, goggles or face shield
5 2 **Symptoms Following Exposure** Dust irritates eyes. Ingestion causes gastric disturbance, tremors, muscular cramps and nervous collapse that may cause death
5 3 **Treatment for Exposure** Following ingestion or unusually severe exposure to dust, get medical attention. Alert doctor to possibility of arsenic poisoning. EYES flush with water for 15 min. SKIN wash with soap and water. INGESTION give large amounts of water, induce vomiting, give cathartic such as 2 oz. of Epsom salt in water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.5 mg/m³ (as arsenic)
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion** Grade 3 LD$_{50}$ 5 to 500 mg/kg
5 7 **Late Toxicity** Arsenic poisoning
5 8 **Vapor (Gas) Irritant Characteristics.** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Poisonous volatile arsenic oxides may be formed in fires
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** Data not available

9. SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Manufacturing Co
584 Mineola Avenue
Carle Place, N Y 11514
2 Cerac Inc
3306 West Silver Spring Rd
Milwaukee, Wis 53051

10. SHIPPING INFORMATION

10 1 **Grades of Purity.** Commercial
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 277.4
13 3 **Boiling Point at 1 atm** Decomposes
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity** (est.) > 3.1 at 20°C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CPB

COPPER BROMIDE

Common Synonyms			
Cupric bromide anhydrous	Solid	Black	Odorless
	Sinks and mixes with water		

Stop discharge if possible. Keep people away.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
Will burn eyes
Irritating to skin

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cupric bromide anhydrous
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula.** $CuBr_2$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Black
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of throat and lungs. Ingestion of large amounts causes violent vomiting and purging, intense pain, collapse, coma, convulsions and paralysis. Contact with solutions causes eye irritation, contact with solid causes severe eye surface injury and skin irritation.
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min., get medical attention if injury was caused by solid. SKIN: flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3, LD_{50} 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Irritating hydrogen bromide gas may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown

9. SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 206 North
Somerville, N J 08876

2 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 384
Jersey City, N J 07303

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure, 99% Reagent
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 223 35
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** 928°F = 498°C = 771°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 4 77 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** −70 9 Btu/lb = −39 4 cal/g = −1 65 × 10^5 J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CPC — COPPER CHLORIDE

Common Synonyms			
Cupric chloride dihydrate Erinochalcite (anhydrous)	Solid	Blue-green	Odorless
	Sinks and mixes with water		

Stop discharge if possible. Keep people away.
Avoid contact with solid and liquid.
Isolate and control discharge if safe to do.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim CONSCIOUS give several glasses of water and have victim induce vomiting.
IF SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm.

SOLID
Will burn eyes.
Irritating to eyes.
If swallowed will cause nausea and vomiting.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim CONSCIOUS give several glasses of water and have victim induce vomiting.
IF SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cupric chloride dihydrate
Erinochalcite (anhydrous)

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $CuCl_2 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Green, blue green, blue

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bu Mines approved respirator, rubber gloves, safety goggles

5 2 **Symptoms Following Exposure:** Inhalation causes coughing and sneezing. Ingestion causes pain and vomiting. Contact with solutions irritates eyes, contact with solid causes severe eye surface injury and skin irritation.

5 3 **Treatment for Exposure:** INHALATION move to fresh air. INGESTION give large amounts of water, induce vomiting, get medical attention. EYES flush with water for 15 min, consult a physician if injury was caused by solid. SKIN flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 500 mg/kg

5 7 **Late Toxicity:** Causes liver damage in rabbits

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride gas may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** In presence of moisture may corrode metals; the reaction is not hazardous

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.009 ppm (as Cu)/*/goldfish/rapid death/fresh water
0.1 0.3 ppm */oyster/toxic/salt water
0.55 ppm/12 hr/mussel/killed/salt water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown

9. SELECTED MANUFACTURERS

1 The Harshaw Chemical Co
1945 E 97th St
Cleveland Ohio 44106

2 J T Baker Chemical Co
Phillipsburg N J 08865

3 Diamond Shamrock Chemical Co
Chemetals Division
711 Pittman Road
Baltimore Md 21226

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent C P
Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM-B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 170.48 (dihydrate)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.54 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CCY — COPPER CYANIDE

Common Synonyms		
Cuprous cyanide Cupricin	Solid powder Sinks in water	White

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause dizziness or loss of consciousness

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause dizziness and loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cupricin Cuprous cyanide
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** CuCN
3 4 **IMCO/United Nations Numerical Designation:** 6 1/1587

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Powder
4 2 **Color:** White
4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator, protective goggles or face mask, protective clothing

5 2 **Symptoms Following Exposure:** Following severe exposure to dust, symptoms of cyanide poisoning may develop (see ingestion). Ingestion causes anxiety, confusion, dizziness, sudden loss of consciousness, odor of bitter almonds on breath or in vomitus, rapid weak pulse, convulsions, and paralysis. Contact with eyes causes irritation.

5 3 **Treatment for Exposure:** *Get medical attention after all exposures to this substance.* INHALATION: remove victim to fresh air. INGESTION: if breathing has stopped begin artificial respiration immediately; administer by inhalation amyl nitrite pearls for 15 - 30 seconds of every minute, while a sodium nitrite solution is being prepared; discontinue amyl nitrite and immediately inject intravenously 10 ml of a 3% soln. of sodium nitrite (nonsterile if necessary) over a period of 2 to 4 min.; do not remove needle, through same needle infuse 50 ml of a 25% aqueous soln. of sodium thiosulfate; injection should take about 10 min. (Concentrations of 15 - 30% are permissible if total dose is approx. 12 grams.) Oxygen therapy may be of value in combination with the above. If symptoms recur, repeat injections of nitrite and thiosulfate at half the above doses. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³ (as cyanide)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4, LD$_{50}$ < 50 mg/kg
5 7 **Late Toxicity:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic hydrogen cyanide gas may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable. In presence of moisture, toxic hydrogen cyanide gas may collect in enclosed spaces
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by bellfish. Hazard to humans unknown

9 SELECTED MANUFACTURERS

1 J T Baker Chemical Co
Phillipsburg, N J 08865

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Pfaltz and Bauer, Inc
126 - 04 Northern Blvd
Flushing, N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical C P
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Closed container

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 89.56
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.92 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

5 HEALTH HAZARDS (Cont'd)

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

CPF

COPPER FLUOROBORATE

Common Synonyms
Cupric fluoborate solution
Copper borofluoride solution
Copper(II) fluoborate solution

Liquid | Dark blue | Odorless

Sinks and mixes with water

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Copper borofluoride solution, Copper(II) fluoborate solution, Cupric fluoborate solution

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Cu(BF_4)_2 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Clear dark blue

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield, rubber apron and gloves

5 2 **Symptoms Following Exposure:** Inhalation of mist irritates nose and throat. Ingestion causes pain and vomiting. Contact causes severe irritation of eyes and irritation of skin

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water and induce vomiting if required. EYES: flush with water for at least 15 min., get medical attention if irritation persist. SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 [LD_{50} 500 mg/kg]

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen fluoride gas may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May corrode some metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown

9. SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 206 North
Somerville, N J 08876

2 Allied Chemical Corp
P O Box 1087R
Morristown, N J 07960

3 The Harshaw Chemical Co
1945 E 97 St
Cleveland, Ohio 44106

10 SHIPPING INFORMATION

10 1 **Grades or Purity:**
Technical, CP } 45 -50% solutions in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 237.16 (solute only)

13 3 **Boiling Point at 1 atm:** (approx.) 212°F = 100°C = 373°K

13 4 **Freezing Point:** Data not available

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.54 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CID

COPPER IODIDE

Common Synonyms			
Cuprous iodide	Solid	Tan or off white	Odorless
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
[illegible]

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea vomiting or loss of consciousness
Remove contaminated clothing or shoes
Flush affected area with plenty of water
IF EYES irritated flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS give small quantities of water or milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cuprous iodide, Marshite
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** CuI
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Beige
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield protective gloves
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat Ingestion of copper salts produces violent vomiting and purging intense pain collapse, coma convulsions and paralysis Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amounts of water, induce vomiting, get medical attention EYES flush with water for at least 15 min SKIN flush with water, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Irritating hydrogen iodide or iodine vapors may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish Hazard to humans unknown

9 SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

2 Pfaltz and Bauer Inc
126 04 Northern Blvd
Flushing N Y 11368

3 Ventron Corp
P O Box 159
Beverly, Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Anhydrous 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 190 4
13 3 **Boiling Point at 1 atm:** 2,354°F = 1,290°C = 1,563°K
13 4 **Freezing Point:** 121°F = 605°C = 878°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 5 62 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CNN — COPPER NAPHTHENATE

Common Synonyms
Paint drier

Liquid | Dark green | Gasoline-like odor

May float or sink in water

Shut off ignition sources. Call fire department.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemicals, foam, carbon dioxide.
Water may be ineffective.
Cool exposed containers with water.

Exposure

Call for medical aid.
LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim rinse mouth with water.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 448-4)

Issue warning: water contaminant.
Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABELS

No label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

- 3.1 **Synonyms:** Paint drier
- 3.2 **Coast Guard Compatibility Classification:** Not applicable
- 3.3 **Chemical Formula:** Mixture
- 3.4 **IMCO/United Nations Numerical Designation:** 3.3/1168

4 OBSERVABLE CHARACTERISTICS

- 4.1 **Physical State (as shipped):** Liquid
- 4.2 **Color:** Dark green
- 4.3 **Odor:** Like gasoline, slight aromatic

5. HEALTH HAZARDS

- 5.1 **Personal Protective Equipment:** Goggles or face shield; plastic gloves (as for gasoline)
- 5.2 **Symptoms Following Exposure:** Vapor causes mild irritation of eyes and mild irritation of respiratory tract if inhaled. Ingestion causes irritation of stomach. Aspiration causes severe lung irritation and rapidly developing pulmonary edema, central nervous system excitement followed by depression.
- 5.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. EYES: wash with copious amounts of water for at least 15 min. SKIN: wipe off and wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. ASPIRATION: enforce bed rest; give oxygen; call doctor.
- 5.4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm
- 5.5 **Short-Term Inhalation Limits:** Data not available
- 5.6 **Toxicity by Ingestion:** Grade 1; oral rat LD_{50} = 4.6 g/kg
- 5.7 **Late Toxicity:** Data not available
- 5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to the eyes and throat.
- 5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

- 6.1 **Flash Point:** 100 F C (typical)
- 6.2 **Flammable Limits in Air:** 0.8% - 5.0% (mineral spirits)
- 6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
- 6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
- 6.5 **Special Hazards of Combustion Products:** Not pertinent
- 6.6 **Behavior in Fire:** Not pertinent
- 6.7 **Ignition Temperature:** 540°F (mineral spirits)
- 6.8 **Electrical Hazard:** Not pertinent
- 6.9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
- 7.2 **Reactivity with Common Materials:** No reaction
- 7.3 **Stability During Transport:** Stable
- 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7.5 **Polymerization:** Not pertinent
- 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 2.0 ppm/72 hr blue-green algae 100% kill fresh water
- 8.2 **Waterfowl Toxicity:** Data not available
- 8.3 **Biological Oxygen Demand (BOD):** 8% 5 days
- 8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Witco Chemical Corporation
   Organics Division
   277 Park Avenue
   New York, N.Y. 10017
2. Cincinnati Milacron Chemicals Inc.
   900 Jersey Ave.
   New Brunswick, N.J. 08903
3. Ferro Corporation
   7050 Krick Rd.
   Bedford, Ohio 44146

10. SHIPPING INFORMATION

- 10.1 **Grades or Purity:** 8% in mineral spirits or mineral oil; 5% in mineral spirits. May float instead of sink in water.
- 10.2 **Storage Temperature:** Ambient
- 10.3 **Inert Atmosphere:** No requirement
- 10.4 **Venting:** Pressure vacuum or open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 448-2)

A-1-E-X-Y

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
- 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
- 12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
- 13.2 **Molecular Weight:** Mixture
- 13.3 **Boiling Point at 1 atm:** 310 - 395°F = 154 - 202°C = 427 - 475°K
- 13.4 **Freezing Point:** Not pertinent
- 13.5 **Critical Temperature:** Not pertinent
- 13.6 **Critical Pressure:** Not pertinent
- 13.7 **Specific Gravity:** 0.93 - 1.05 at 25°C (liquid)
- 13.8 **Liquid Surface Tension:** 20 dynes/cm = 0.020 N/m at 20°C
- 13.9 **Liquid-Water Interfacial Tension:** 45 dynes/cm = 0.045 N/m at 20°C
- 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 13.12 **Latent Heat of Vaporization:** Not pertinent
- 13.13 **Heat of Combustion:** (est.) = -17,600 Btu/lb = -9,800 cal/g = -410 × 10³ J/kg
- 13.14 **Heat of Decomposition:** Not pertinent
- 13.15 **Heat of Solution:** Not pertinent
- 13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CNI

COPPER NITRATE

Common Synonyms	Solid	Blue	Odorless
Cupric nitrate trihydrate Gerhardite	Sinks and mixes with water		

Fire

Not flammable
Will increase the intensity of a fire
Irritating gases may be produced when heated

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Will burn eyes
If swallowed will cause nausea vomiting or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cupric nitrate trihydrate, Gerhardite

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Cu(NO_3)_2 \cdot 3H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Blue

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of throat and lungs Ingestion of large amounts causes violent vomiting and purging intense pain collapse coma convulsions and paralysis Solutions irritate eyes contact with solid causes severe eye surface injury and skin irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amounts of water induce vomiting get medical attention EYES flush with water for at least 15 min , get medical attention if injury was caused by solid SKIN flush with water

5 4 **Toxicity by Inhalation(Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of nitrogen may form in fire

6 6 **Behavior in Fire:** Can increase intensity of fire if in contact with combustible material

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Mixtures with wood paper and other combustibles may catch fire

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
5 ppm 11 hr rainbow trout killed fresh water
0 22 1 0 ppm 48 240 hr barnacles & related species killed salt water
1 9 ppm 96 hr oyster TL_m salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish Can be concentrated by food chain Hazard to humans unknown

9. SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 206 North
Somerville N J 08876

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

3 J T Baker Chemical Co
Phillipsburg N J 08865

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure 100% Technical Reagent May also be shipped as anhydrous grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	1
Flammability (Red)	0	0
Reactivity (Yellow)	0	0
	OXY	OXY

*First column refers to no fire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 241 60

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:**
238 1°F = 114 5°C = 387 7°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2 32 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 204

NOTES

COL

COPPER OXALATE

Common Synonyms
Cupric oxalate hemihydrate

Solid | Bluish white | Odorless

Sinks in water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cupric oxalate hemihydrate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $CuC_2O_4 \cdot H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Bluish white
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion of very large amounts may produce symptoms of oxalate poisoning; watch for edema of the glottis and delayed constriction of esophagus. Contact with eyes causes irritation.
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air; if exposure has been prolonged watch for symptoms of oxalate poisoning (nausea, shock, collapse, and convulsions). INGESTION: give large amount of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic carbon monoxide gas may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown

9 SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Mfg. Co.
584 Mineola Ave.
Carle Place, N. Y. 11514

2 Pfaltz and Bauer, Inc.
126-04 Northern Blvd.
Flushing, N. Y. 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 160.6
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** > 1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1-COL-5

NOTES

CSF

COPPER SULFATE

Common Synonyms
Blue Vitriol
Sulfate of copper
Copper sulfate pentahydrate
Cupric sulfate

Solid-granules or crystals | White to blue | Odorless

Sinks and mixes with water

Isolate and restrict discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

SOLID
If swallowed, will cause nausea, vomiting or loss of consciousness
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting; keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Blue vitriol
Copper sulfate pentahydrate
Cupric sulfate
Sulfate of copper

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CuSO_4 \cdot 5H_2O$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Blue

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Filtering masks to minimize inhalation of dust

5.2 **Symptoms Following Exposure:** INGESTION - copper sulfate may induce severe gastrointestinal distress consisting gastrointestinal pain and bloody emesis and hemorrhagic prostration; anuria, hematuria, anemia, increased white blood cell count, central nervous system disorders and circulatory failure

5.3 **Treatment for Exposure:** INGESTION - induce vomiting and administer water, sweet cream, chocolate milk, egg albumin, fluid therapy and transfusions if required; calcium disodium EDTA has been used to detoxify copper; SULFASUXIDE may be effective as an antidote

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 3 LD_{50} 300 mg/kg (rats)

5.7 **Late Toxicity:** Causes liver, kidney and testicular damage in rats

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
4.8 ppm/24 hr rainbow trout TLm/fresh water
0.14 ppm/48 hr prawn LC/salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Anaconda Co.
Great Falls, Mont. 59401

2. Cities Service Co., Inc.
Industrial Chemicals Division
60 Wall St.
New York, N.Y. 10005

3. Mallinckrodt Chemical Works
Industrial Chemicals Division
St. Louis, Mo. 63160

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(see Hazard Assessment Handbook, CG-446-3)

NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 249.7

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.29 at 15°C (solids)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 4

NOTES

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CSY — CORN SYRUP

Common Synonyms

Thick liquid | Colorless | Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

Not harmful

Water Pollution

Dangerous to aquatic life at high concentrations
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARG:

Dispersal and flush

2. LABELS

No Hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** None known

3 2 **Coast Guard Compatibility Classification:** Noncontaminous water solutions

3 3 **Chemical Formula:** Not pertinent

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** None

5 2 **Symptoms Following Exposure:** Not known

5 3 **Treatment for Exposure:** None

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** None

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** None

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD):** 50% 5 days 90% after 10 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. CPC International Inc
   Argo Ill 60501
2. A E Staley Mfg Co
   Decatur Ill 62525
3. Standard Brands Inc
   Clinton Corn Processing Co Division
   Clinton, Iowa 52732

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

N P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.4 at 15° C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

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COU

COUMAPHOS

Common Synonyms
CORAL
O,O-Diethyl O-(3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl) phosphorothioate

solid | white | Weak sulfurous odor

Solid sinks in water

Fire

Combustible

Exposure

CALL FOR MEDICAL AID
SOLID OR DUST
Irritating to skin and eyes
Harmful if swallowed or inhaled

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** CO RAL; O,O-Diethyl O-(3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl) phosphorothioate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{14}H_{16}ClO_5PS$

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1951

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Slight odor of sulfur compounds

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor respirator, rubber gloves, goggles

5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes sense of tightness in chest, sweating, contracted pupils of eyes, stomach pains, vomiting, and diarrhea. Pulmonary edema may develop as long as 12 hours after acute exposure. Contact with eyes causes irritation; overexposure may cause unresponsive pupils and blurred vision.

5.3 **Treatment for Exposure:** *Get medical attention; after all overexposures to this substance.* Atropine sulfate and 2-PAM are antidotes. INHALATION: remove to fresh air, support respiration, keep patient quiet until medical help arrives; observe for development of pulmonary edema even after 12 hours. INGESTION: induce vomiting, give water and again induce vomiting, give agar to slurry of medicinal charcoal. EYES: flush with water for at least 15 min. SKIN: wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4; oral LD_{50} 5 mg/kg (rats)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 0.02 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water fog, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of sulfur and phosphorus may form in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Non-reactive

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] Bluegill TL_m [illegible] Upper Incipient lethal [illegible] water

8.2 **Waterfowl Toxicity:** [illegible] LD_{50}

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Harvel Corporation
Box 490
Shawnee Mission, Kan. 66201

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** [illegible] active ingredient, the balance being inert solids

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 362.5

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.478 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible] Limits

NOTES

CCT

CREOSOTE, COAL TAR

Common Synonyms			
Creosote oil Dead oil	Liquid	Yellow to black	Tarry odor
	May float or sink in water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shorelines May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook • CG-446-4)

Issue warning - water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

Not specifically listed by U.S. Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Creosote oil
Dead oil

3.2 **Coast Guard Compatibility Classification:** Group 1

3.3 **Chemical Formula:** Mixture

3.4 **IMCO/United Nations Numerical Designation:** 9 2022

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Yellow to brown to black

4.3 **Odor:** Creosote or tarry odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear chemical safety goggles and face shield; overalls; impervious gloves; boots.

5.2 **Symptoms Following Exposure:** Vapors cause moderate irritation of eyes and nose. Liquid causes severe burns of eyes and reddening and irritation of skin. Prolonged contact with skin can cause cancer. Ingestion causes salivation, vomiting, gastrointestinal difficulties, chronic pains, severe headache. Dilated pupils reflects hypothermia. Coma may result in severe cases.

5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air. Administer oxygen if victim has difficulty breathing. Give artificial respiration preferably mouth-to-mouth, if breathing difficult. Get medical attention. EYES: Wash immediately with plenty of water for at least 15 minutes. Get medical attention. SKIN: Wash with vegetable oil or soap and water. Then wash with soap and water. INGESTION: Have victim drink water (two glasses at most). DO NOT induce vomiting.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] mg/kg

5.7 **Late Toxicity:** Repeated exposures may cause cancer of skin

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation and lachrymation at concentrations of [illegible] ppm and high concentrations are painful. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Liquid severely irritating. May cause pain and severe degree burns after a few minutes contact.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** > 150°F (65.6°C)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide or foam

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Data not available

6.6 **Behavior in Fire:** Heavy smoke during black smoke is formed

6.7 **Ignition Temperature:** 637°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Allied Chemical Corporation
Plastics Division
[illegible] Plaza Avenue
New York, N.Y. [illegible]

Koppers Company, Inc.
Organic Materials Division
Koppers Building
Pittsburgh, Pa. 15219

Allied Chemical Corporation
Semet Solvay Division
Frankford Arsenal Plant
1100 North Third Street
Philadelphia, Pa.

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Whole creosote or various fractions depending on boiling point. All have similar properties

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrestors

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

V E N X

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	4
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Mixture

13.3 **Boiling Point at 1 atm:** > 150°F = > 65.6°C = > 338.8°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.01 - 1.06 at 20°C/20°C liquid

13.8 **Liquid Surface Tension:** (dynes/cm) 41.8 at 20°C

13.9 **Liquid-Water Interfacial Tension:** (dynes/cm) 0.026 at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** (-) 17,000 Btu/lb = -9,444 cal/g = -395.4 kJ/g

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(continued on page 7 and 8)

NOTES

CRS

CRESOLS

Common Synonyms
Cresylic acids
dihydroxytoluenes
Methylphenols
Oxybenzenes

Watery liquid or solid crystals Colorless or yellow Sweet tarry odor

Sinks in water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
Cresol
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to Be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

*10.1 Grades or Purity:

11 HAZARD ASSESSMENT CODE

A.P.Q.T.E.V.1

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
Poisonous liquid, n.o.s. (Cresol), Class B
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poison	3
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	4
Reactivity	
Other Chemicals	2
Water	2
Self Reactivity	0

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard-Blue	3
Flammability-Red	2
Reactivity-Yellow	0

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm:
*13.2 Molecular Weight:
*13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
*13.5 Critical Temperature:
13.6 Critical Pressure:
*13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
Data not available
*13.10 Vapor (Gas) Specific Gravity:
*13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

10 SHIPPING INFORMATION (Cont'd.)

10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting: Open

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CGE — CRESYL GLYCIDYL ETHER

Common Synonyms	Solid	White
	Sinks and mixes with water	

Stop discharge if possible. Keep people away.
Shut off ignition sources. Call fire department.
Avoid contact with solid and dust.
Collect and remove discharged material.
Notify local health and pollution control agencies.

Fire	**Combustible** Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	**CALL FOR MEDICAL AID** **DUST** Irritating to eyes, nose and throat. Harmful if inhaled. [illegible] **SOLID** Irritating to skin and eyes. Harmful if swallowed. [illegible] IF IN EYES: Gently wash with plenty of water. IF SWALLOWED: Induce vomiting. Call physician immediately. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: Do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-6)

Issue warning: water contaminant.
Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cresol epoxypropyl ether. Tolyl epoxypropyl ether. Tolyl glycerol ether.

3 2 **Coast Guard Compatibility Classification:** Not listed.

3 3 **Chemical Formula.** $CH_3C_6H_4OCH_2CH(O)CH_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed.

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid.

4 2 **Color:** Colorless.

4 3 **Odor:** Data not available.

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic canister mask or air pack; rubber gloves; goggles or face shield; body covering clothing.

5 2 **Symptoms Following Exposure.** Contact with eyes causes irritation. Contact with skin causes primary irritation and allergic sensitization.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water for at least 15 min.; get medical attention. SKIN: immediately wash off with soap & water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available.

5 5 **Short-Term Inhalation Limits:** Data not available.

5 6 **Toxicity by Ingestion.** Data not available.

5 7 **Late Toxicity:** Data not available.

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available.

5 9 **Liquid or Solid Irritant Characteristics.** Data not available.

5 10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6 1 **Flash Point:** 200°F O.C.

6 2 **Flammable Limits in Air:** Data not available.

6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide.

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective.

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available.

6 8 **Electrical Hazard:** Data not available.

6 9 **Burning Rate:** Data not available.

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction.

7 2 **Reactivity with Common Materials:** May attack some forms of plastics.

7 3 **Stability During Transport:** Stable.

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent.

7 5 **Polymerization:** Not pertinent.

7 6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available.

8 2 **Waterfowl Toxicity:** Data not available.

8 3 **Biological Oxygen Demand (BOD)** Data not available.

8 4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

Shell Chemical Co.
One Shell Plaza
P. O. Box 2463
Houston, Texas 77001

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 100%.

10 2 **Storage Temperature:** Ambient.

10 3 **Inert Atmosphere:** No requirement.

10 4 **Venting:** Open.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T U-X-Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed.

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.

12 3 **NFPA Hazard Classifications:** Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid.

13 2 **Molecular Weight:** 164.

13 3 **Boiling Point at 1 atm:** (approx.) 498°F = 259°C = 532°K.

13 4 **Freezing Point:** Not pertinent.

13 5 **Critical Temperature:** Not pertinent.

13 6 **Critical Pressure:** Not pertinent.

13 7 **Specific Gravity:** 1.09 at 20°C (liquid).

13 8 **Liquid Surface Tension** Data not available.

13 9 **Liquid-Water Interfacial Tension.** Data not available.

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent.

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent.

13 12 **Latent Heat of Vaporization.** Data not available.

13 13 **Heat of Combustion:** (est.) = −16 500 Btu/lb = −9 190 cal/g = −384 × 10³ J/kg.

13 14 **Heat of Decomposition.** Not pertinent.

13 15 **Heat of Solution:** Not pertinent.

13 16 **Heat of Polymerization:** Not pertinent.

Continued on page 5 and 6.

NOTES

CTA

CROTONALDEHYDE

Common Synonyms
Crotonic aldehyde
beta-Methylacrolein
trans-2-Butenal

Watery liquid | Yellow | Tar odor

Floats and mixes slowly with water. Flammable irritating vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

CALIFORNIA PROP 65 LISTED

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause coughing, nausea, vomiting or loss of consciousness.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN OR EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.
IF SWALLOWED, GIVE WATER OR MILK. DO NOT INDUCE VOMITING.

Water Pollution

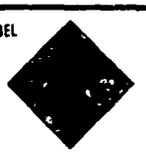
Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, water contaminant.
Restrict access.
Disperse and flush.

2 LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
beta-Methylacrolein
Crotenaldehyde
Crotonic aldehyde
trans-2-Butenal

3.2 **Coast Guard Compatibility Classification:** Aldehyd

3.3 **Chemical Formula:** $CH_3CH{=}CHCHO$

3.4 **IMCO/United Nations Numerical Designation:** UN 1143

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Yellow

4.3 **Odor:** Tarry

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask for concentrations above 2% by volume; plastic gloves; monogoggles; eye bath; rapid safety shower.

5.2 **Symptoms Following Exposure:** INHALATION: vapors exceedingly irritating, causing coughing, chest pain, nausea, vomiting, and collapse. CONTACT WITH SKIN OR EYES: may cause burns and systemic illness. Contact of liquid or vapors with eyes causes burns.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; give oxygen if breathing is difficult; call a physician. INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN OR EYES: immediately flush with plenty of water for at least 15 min; physician should see cases of eye irritation from vapor or liquid.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3; LD$_{50}$: 50 to 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Exhibits severe skin irritant effects causing pain and second degree burns after a few minutes' contact.

5.10 **Odor Threshold:** 0.13 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 59°F O.C.

6.2 **Flammable Limits in Air:**
2.1% - 15.5%

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Vapors are very irritating to nose, eyes and skin.

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.

6.7 **Ignition Temperature:** 450°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.3 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** May polymerize

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** May polymerize or condense with evolution of heat in presence of alkalies, amines or acids.

7.6 **Inhibitor of Polymerization:** None used

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 1.3 lb/lb in 10 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Division
245 Park Ave.
New York, N.Y. 10017

2. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 98.0

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Liquid

13.2 **Molecular Weight:** 70.09

13.3 **Boiling Point at 1 atm:**
216.9°F = 102.7°C = 375.8 K

13.4 **Freezing Point:**
-100°F = -75°C = 198 K

13.5 **Critical Temperature:**
365°F = 296°C = 569 K

13.6 **Critical Pressure:**
630 psia = 43 atm = 4.4 MN/m²

13.7 **Specific Gravity:** 0.852 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.104

13.12 **Latent Heat of Vaporization:**
240 Btu/lb = 141 cal/g = 4.65 × 10⁵ J/kg

13.13 **Heat of Combustion:**
-14,000 Btu/lb
= -7760 cal/g = -325 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

CUM

CUMENE

Common Synonyms
Cumol
Isopropylbenzene

Watery liquid | Colorless | Gasoline-like odor

Floats on water

[illegible] if product is [illegible]
Call fire department
Avoid [illegible]
[illegible]
Stay [illegible]

Fire

Combustible.
[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
[illegible]
PLANTS [illegible]
IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Cumol
Isopropylbenzene

3 2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon

3 3 **Chemical Formula:** $C_6H_5CH(CH_3)_2$

3 4 **IMCO/United Nations Numerical Designation:** 1918

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Strong, slightly irritant, fragrant, aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** [illegible] necessary to avoid skin exposure. If concentration in air is greater than 1000 ppm, use self-contained breathing apparatus.

5 2 **Symptoms Following Exposure:** Narcotic action with long lasting effects; depressant to central nervous system.

5 3 **Treatment for Exposure:** INHALATION: move patient immediately to fresh air; administer artificial respiration or oxygen if necessary; seek medical attention. SKIN OR EYES: wash exposed skin surfaces thoroughly; flush eyes thoroughly with water for 15 min.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3; LD_{50} 50 to 500 mg/kg

5 7 **Late Toxicity:** None reported

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor causes slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If splashed on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** 1.2 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 111°F C.C.

6 2 **Flammable Limits in Air:** 0.9% - 6.5%

6 3 **Fire Extinguishing Agents.** Foam, carbon dioxide or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 797°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 3.9 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 110 ppm/24 hr/Brine Shrimp/TLm

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 40% of theoretical in 5 days, fresh water

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Gulf Oil Corp.
Gulf Oil Chemicals Co. Div.
Cedar Bayou, Texas 77520

2 Monsanto Co.
Monsanto Polymers & Petrochemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

3 Union Carbide Corp.
Chemicals & Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Research grade, pure grade, technical grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 120.19

13 3 **Boiling Point at 1 atm:**
306.3°F = 152.4°C = 425.6°K

13 4 **Freezing Point.**
−140.9°F = −96.1°C = 177.1°K

13 5 **Critical Temperture**
676.2°F = 357.9°C = 631.1°K

13 6 **Critical Pressure:**
465.5 psia = 31.67 atm = 3.209 MN/m²

13 7 **Specific Gravity:** 0.8662 at 15°C (liquid)

13 8 **Liquid Surface Tension**
28.2 dynes/cm = 0.0282 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:**
54.6 dynes/cm = 0.0546 N/m at 22.7°

13 10 **Vapor (Gas) Specific Gravity**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
1.099

13 12 **Latent Heat of Vaporization:**
134 Btu/lb = 74.6 cal/g = 3.1 × 10⁵ J/kg

13 13 **Heat of Combustion.** −17,710 Btu/lb
= −9840 cal/g = −412.0 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** No [illegible]

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 [illegible]

NOTES

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CMH — CUMENE HYDROPEROXIDE

Common Synonyms
alpha alpha-Dimethylbenzene hydroperoxide
Dimethylbenzyl hydroperoxide
CHP
Isopropylbenzene hydroperoxide
Cumyl hydroperoxide

Liquid | Colorless to light yellow | Sharp irritating odor

Sinks in water

[illegible] Keep [illegible]
Call [illegible]
[illegible]
[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
[illegible]
Water may be ineffective
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache or coughing
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IN EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning: oxidizing material
water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** alpha alpha Dimethylbenzene hydroperoxide, Dimethylbenzyl hydroperoxide, Isopropylbenzene hydroperoxide, Cumyl hydroperoxide, CHP

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula:** $C_6H_5C(OOH)(CH_3)_2$
$C_6H_5C(CH_3)_2H$ (mixture)

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to pale yellow

4 3 **Odor:** Sharp irritant aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained or airline breathing apparatus solvent resistant rubber gloves chemical splash goggles rubber apron rubber or PVC clothing full face shield

5 2 **Symptoms Following Exposure:** Inhalation of vapor causes headache and burning throat Liquid causes severe irritation to eyes on skin causes burning throbbing sensation irritation and blisters Ingestion causes irritation of mouth and stomach

5 3 **Treatment for Exposure** Get medical attention after all exposures to this compound
INHALATION remove victim and administer artificial respiration and oxygen if necessary
EYES flush with water for 15 min SKIN wash several times with soap and water treat as burn
INGESTION induce vomiting and follow with gastric lavage

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 382 mg kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 147°F O C 120 F C C

6 2 **Flammable Limits in Air** 0 9 [illegible]

6 3 **Fire Extinguishing Agents:** Foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Toxic phenol vapors may form from hot material

6 6 **Behavior in Fire** May decompose violently when heated Burning rate becomes more rapid as fire burns

6 7 **Ignition Temperature.** Decomposes violently at temperatures above 300°F

6 8 **Electrical Hazard.** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** Decomposition is catalyzed by metals such as aluminum copper brass zinc and lead The reaction is not hazardous unless hot

7 3 **Stability During Transport:** Stable if kept below 125°F and out of direct sunlight

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Hercules Incorporated
Organics Department
Wilmington Del 19899

2 Reichhold Chemicals, Inc
Specialty Chemicals Division
P O Box 9405
Austin Texas 78766

3 Allied Chemical Corporation
Plastics Division
P O Box 2365R
Morristown N J 07960

10 SHIPPING INFORMATION

10 1 **Grades or Purity** 85% the balance being cumene hydrocarbon

10 2 **Storage Temperature:** Below 125°F

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Containers must be stored in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

ATUAY

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Organic Peroxide

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	4
	OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** Mixture

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** 16°F = −9°C = 264 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 1 03 at 25 C (liquid)

13 8 **Liquid Surface Tension.** (est.) 25 dynes cm = 0 025 N m at 20 C

13 9 **Liquid-Water Interfacial Tension** (est.) 30 dynes cm = 0 030 N m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion** (est.) −13 500 Btu lb = −7 400 cal g = −310 × 10 J kg

13 14 **Heat of Decomposition.** −855 Btu lb = −475 cal g = −199 × 10 J kg

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and A

3 CHEMICAL DESIGNATIONS (Cont'd)

3 4 **NIOSH/United Nations Numerical Designation.** 52/1524

CES — CUPRIETHYLENEDIAMINE SOLUTION

Common Synonyms

Liquid | Blue to dark purple | Fishy odor

Sinks and mixes with water. Irritating vapor is produced.

AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY.
[illegible]

Fire

Not flammable.
Irritating gases may be produced when heated.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause difficult breathing.
[illegible]

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Irritating to skin and eyes.
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED, [illegible]
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive water contaminant.
Restrict access.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cuprethylenediamine hydroxide solution

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $Cu(OH)_2 \cdot NH_2CH_2CH_2NH_2 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation:** 8/1761

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Blue or dark purple (May contain red or blue sediment)

4 3 **Odor:** Like ammonia; fishy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield; organic canister mask; rubber gloves; protective clothing.

5 2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membrane and may cause asthma. Liquid causes severe irritation of eyes and possible corneal injury. Contact with skin causes irritation. Ingestion causes irritation of mouth and stomach.

5 3 **Treatment for Exposure:** INHALATION: remove from exposure, support respiration, call physician. EYES: irrigate with copious quantities of water for at least 15 min., call physician. SKIN: wash with large amounts of water. INGESTION: give large amounts of water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Non flammable solution

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Irritating vapors of ethylenediamine may be produced when heated

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Dissolves cotton, wood and other cellulosic materials. Corrosive to copper, aluminum, zinc, and tin.

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Olin Corporation
Fiesta Paper Division
Pisgah Forest, N. C. 28768

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** Nitrogen

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NPQ

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Mixture

13 3 **Boiling Point at 1 atm:** (approx.) 212°F = 100°C = 373° K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (est.) > 1.1 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CYA CYANOACETIC ACID

Common Synonyms
Cyanacetic acid
Malonic mononitrile

Liquid | Yellowish brown | Unpleasant odor

Sinks and mixes with water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cyanacetic acid
Malonic mononitrile

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** $CNCH_2COOH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** White

4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Contact irritates eyes and may irritate skin

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and toxic and flammable acetonitrile vapors may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Kay Fries Chemicals Inc
360 Lexington Ave
New York, N Y 10017

2 Eastman Organic Chemicals
Rochester, N Y 14650

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee, Wis 53233

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 ***NAS Hazard Rating for Bulk Water Transportation:*** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	3
Flammability (Red)	1	1
Reactivity (Yellow)	0	0

*First column refers to nonfire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 85.06

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 151°F = 66°C = 339°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** >1.1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** = -9,300 Btu/lb = -3,500 cal/g = -146 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 1 and 4

NOTES

CYG

CYANOGEN

Common Synonyms

Ethane dinitrile
Dicyan
Oxalic acid dinitrile
Oxalonitrile
Dicyanogen

Liquefied gas Colorless Almond Odor

Floats and boils on water. Poisonous flammable vapor cloud is produced.

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes

LIQUID
POISONOUS IF SWALLOWED
Will cause frostbite

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, high flammability, air contaminant, water contaminant
Restrict access
Evacuate area

2 LABELS





3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ethanedinitrile, Dicyan, Oxalic acid dinitrile, Oxalonitrile, Dicyanogen

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $(CN)_2$

3 4 **IMCO/United Nations Numerical Designation.** 2/1026

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** Characteristic almond like pungent penetrating; may not be sufficiently strong to provide an adequate warning

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus; rubber gloves; rubber protective clothing, rubber-soled shoes

5 2 **Symptoms Following Exposure:** Vapor irritates eyes and causes giddiness, headache, fatigue and nausea if inhaled

5 3 **Treatment for Exposure:** In general, treatment is similar to that used following exposure to hydrogen cyanide. INHALATION: move victim to fresh air and have him lie down; do not permit him to exert himself; remove contaminated clothing but keep patient covered and comfortably warm; summon a physician; break an amyl nitrite pearl in a cloth and hold it lightly under the victim's nose for 15 seconds; repeat five times at about 15 sec. intervals; use artificial respiration if breathing has stopped. EYES: flush with water for at least 15 min.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm

5 5 **Short-Term Inhalation Limits:** 5 mg/m for 30 min. (as a cyanide)

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Flammable gas

6 2 **Flammable Limits in Air:** 6.6% - 42%

6 3 **Fire Extinguishing Agents:** Let fire burn; shut off flow of gas; cool exposed areas with water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Unburned vapors are highly toxic

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode in fire releasing the highly toxic gas

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction but water provides heat to vaporize liquid cyanogen

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Matheson Gas Products
P O Box 85
East Rutherford, N J 07073

2 Air Products and Chemicals, Inc
Specialty Gas Dept
P O Box 538
Allentown, Pa 18105

3 Union Carbide Corp
Linde Division
270 Park Avenue
New York, N Y 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 98.5%

10 2 **Storage Temperature:** Cool, ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Store containers in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A B C K-I-M N

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous Class A

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 52.0

13 3 **Boiling Point at 1 atm:** −6.1°F = −21.1°C = 252.1°K

13 4 **Freezing Point:** −18.2°F = −27.9°C = 245.3°K

13 5 **Critical Temperature:** 259.9°F = 126.6°C = 399.8°K

13 6 **Critical Pressure:** 857 psia = 58.2 atm = 5.91 MN/m

13 7 **Specific Gravity:** 0.954 at −21°C (liquid)

13 8 **Liquid Surface Tension:** 22 dynes/cm = 0.022 N/m at −21°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 1.8

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.205 at 25°C

13 12 **Latent Heat of Vaporization:** 200 Btu/lb = 111 cal/g = 4.65 × 10 J/kg

13 13 **Heat of Combustion:** −9 059 Btu/lb = −5 033 cal/g = −210.6 × 10 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 2 520 Btu/lb = 1 400 cal/g = 58.5 × 10 J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CBR — CYANOGEN BROMIDE

Common Synonyms	Solid crystals Colorless Penetrating odor Sinks and mixes with water

AVOID CONTACT WITH SOLID and gas or vapor
Wear self-contained positive pressure breathing apparatus
Isolate and ventilate area
Keep unnecessary people away

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED
Use chemical, foam, or water spray to extinguish fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLIDS
POISONOUS IF SWALLOWED
Will burn skin and eyes
Remove contaminated clothing and shoes
Flush eyes with water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, induce vomiting by tickling back of throat with finger or by giving syrup of ipecac, warm salt water or mustard
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue safety precautions
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** BrCN
3 4 **IMCO/United Nations Numerical Designation:** 6 1 1889

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color:** Colorless
4 3 **Odor:** Penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical cartridge respirator, goggles, protective clothing, rubber gloves
5 2 **Symptoms Following Exposure:** Same symptoms as hydrogen cyanide. Because it irritates the eyes, throat, and lungs severely, it is unlikely that anyone would voluntarily remain in areas with a high enough concentration to cause an acute effect
5 3 **Treatment for Exposure:** Call a physician. INHALATION: remove victim to fresh air. If victim is not breathing, give artificial respiration, preferably mouth to mouth. If symptoms of cyanide poisoning are observed, administer amyl nitrite as instructed for HCN. INGESTION: have victim drink water or milk; do NOT induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.3 ppm (suggested)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Workers exposed to solutions may develop dermatitis
5 8 **Vapor (Gas) Irritant Characteristics:** Vapor can cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations
5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact. Very injurious to the eyes
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Poison gases are produced in fire
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Strong bleaching powder solution, let stand 24 hr
7 5 **Polymerization:** Does not occur
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Apache Chemicals, Rockford, Ill 61105
2 Columbia Organic Chemicals Inc, 912 Drake St, Columbia, S C 29205
3 Eastman Kodak Co, Eastman Organic Chemicals Division, Rochester, N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Data not available
10 2 **Storage Temperature:** Data not available
10 3 **Inert Atmosphere:** Data not available
10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	1
Self Reaction	1

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 105.93
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point** 120 to 124°F = 49 to 51°C = 322 to 324°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.01 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 3.6
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5A

NOTES

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CCL

CYANOGEN CHLORIDE

Common Synonyms

Liquid or compressed gas Colorless Sharp pungent odor

Poisonous vapor cloud is produced Boiling point is 56° F

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED IN FIRE

Exposure

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Water Pollution

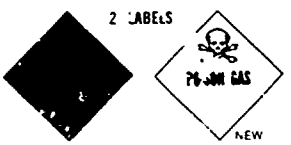
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6)

Issue warning: poison
Restrict access
Evacuate area

2 LABELS



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Nitrogen monochloride
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** CNCl
3 4 **IMCO/United Nations Numerical Designation:** 6 1 1589

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Compressed gas
4 2 **Color:** Colorless
4 3 **Odor:** Acrid choking

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** [illegible] respirator, protective clothing
5 2 **Symptoms Following Exposure:** Symptoms include a mucous membrane irritation with a burning sensation of the respiratory tract, with a heavy chest, edema of the throat and trachea and pulmonary edema. It is improbable that anyone would tolerate [illegible] which might cause serious injury or death
5 3 **Treatment for Exposure:** INHALATION: [illegible] oxygen call a doctor. Do not administer anything. INGESTION: Induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm
5 5 **Short-Term Inhalation Limit:** Data not available
5 6 **Toxicity by Ingestion:** Not pertinent
5 7 **Late Toxicity:** Long term exposure causes dermatitis, loss of appetite, headache, upper respiratory irritation in humans
5 8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations
5 9 **Liquid or Solid Irritant Characteristics.** Severe irritant. Causes second and third degree burns on short contact. Severe irritation to the eyes
5 10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Overheated containers can explode
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Very slow reaction
7 2 **Reactivity with Common Materials:** Slow, not immediately hazardous
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 0.03 ppm* fish killed (trout, salmon)
*Duration not specified
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Manufacturing Corp
Carlstadt Chemical Co Division
584 Mineola Ave
Carle Place N Y 11514

2 Nuvek Chemicals Inc
5040 Mullington Road
Memphis Tenn 38127

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature:** Data not available
10 3 **Inert Atmosphere:** Data not available
10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

ACUX

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous gas or liquid, Class A
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Gas
13 2 **Molecular Weight:** 61.48
13 3 **Boiling Point at 1 atm.** 56°F = 13°C = 286.15°K
13 4 **Freezing Point:** 20°F = -6.9°C = 266.15°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.22 at 0°C (liquid)
13 8 **Liquid Surface Tension:** 24.6 dynes/cm = 0.0246 N/m at 19°C
13 9 **Liquid-Water Interfacial Tension.** Data not available
13 10 **Vapor (Gas) Specific Gravity:** 2.1
13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.22+
13 12 **Latent Heat of Vaporization** [illegible] = [illegible] cal/g = 4.5 [illegible] x 10 J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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CHX — CYCLOHEXANE

Common Synonyms: Hexahydrobenzene

Water's liquid — Colorless — Gasoline-like odor

Floats on water. Flammable irritating vapor is produced. Freezing point is 44° F.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, nausea, vomiting or loss of consciousness.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Isolate and deny entry. Keep away from heat, sparks and flame.
Evacuate area.
Disperse and flush.

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Hexahydrobenzene
Hexamethylene
Hexanaphthene

3.2 **Coast Guard Compatibility Classification:** Paraffin

3.3 **Chemical Formula:** C_6H_{12}

3.4 **IMCO United Nations Numerical Designation:** 3.1 1145

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Resembling benzene and weak resembling chloroform

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Hydrous NH3 vapor canister supplied air or self-contained hydrocarbon resistant rubber or plastic gloves, chemical goggles or face splash shield, hydrocarbon resistant rubber or plastic apron.

5.2 **Symptoms Following Exposure:** Dizziness, nausea and/or unconsciousness. Liquid or vapor may cause skin irritation and sunburn.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air if breathing has stopped, apply artificial respiration and administer oxygen. SKIN OR EYE CONTACT: remove contaminated clothing and gently flush affected areas with water for 15 minutes or more.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 400 ppm

5.5 **Short-Term Inhalation Limits:** 500 ppm for 60 min

5.6 **Toxicity by Ingestion:** Grade 1 Data Available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** −4°F C.C.

6.2 **Flammable Limits in Air:** 1.3% x 8%

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 518°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 15,500 ppm/24 hr/mosquito fish/TLm/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Exxon Chemical Co., Houston, Texas 77001
2. Phillips Petroleum Co., Bartlesville, Okla. 74004
3. Texaco Inc., 135 East 42nd St., New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Research grade 99.5+% pure; commercial 99.0%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrestors or pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

X-T-L-Y-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health:	
Vapor Irritant	1
Foundry Solid Irritant	1
Poisons	2
Water Pollution:	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity:	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 84.16

13.3 **Boiling Point at 1 atm:** 80.74°C (177.33°F) = 353.9°K

13.4 **Freezing Point:** 6.54°C (43.77°F) = 279.7°K

13.5 **Critical Temperature:** 280.3°C (536.5°F) = 553.5°K

13.6 **Critical Pressure:** 592 psia = 40.2 atm = 4.07 MN/m²

13.7 **Specific Gravity:** 0.779 at 20°C/4°C

13.8 **Liquid Surface Tension:** 24.7 dynes/cm = 0.0247 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 50 dynes/cm = 0.050 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** 2.9

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.08

13.12 **Latent Heat of Vaporization:** 169 Btu/lb = 2.09 x 10⁵ J/kg = 93.0 cal/g = 389 J/g-mol

13.13 **Heat of Combustion:** −1,442 Btu/lb = −8,015 cal/g = −1,802 x 10⁵ J/kg = −1,802 J/g-mol

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

NOTES

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CHN

CYCLOHEXANOL

Common Synonyms
Hexalin
Hexahydrophenol
Cyclohexyl alcohol
Hydroxycyclohexane

Oily liquid | Colorless to light yellow | Alcohol odor

Floats and mixes slowly with water. May solidify. Freezing point is 75° F.

Fire

Combustible

Exposure

LIQUID OR SOLID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**

Adronal	Hexalin
Anol	Hexahydrophenol
Cyclohexyl alcohol	Hydroxycyclohexane

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $C_6H_{11}OH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid

4.2 **Color:** Colorless to faintly yellow

4.3 **Odor:** Like camphor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield

5.2 **Symptoms Following Exposure:** Narcosis, depression of the central nervous system tending to produce sleep or unconsciousness

5.3 **Treatment for Exposure:** Eye contact is more hazardous than inhalation, skin irritation or ingestion. Flush eyes with water and remove contaminated clothing

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD50 Not established

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause slight smarting. The eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of eyes and skin. 1st degree burns on short exposure and may cause severe burns on long exposure.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 160°F (O.C.) 154°F (C.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 572°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.9 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0.08 lb/lb, 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Specialty Chemicals Division
Hopewell, Va. 23860

2. Monsanto Co.
Monsanto Industrial Chemicals Co.
St. Louis, Mo. 63166

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical pure

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

XPQTU

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 100.16

13.3 **Boiling Point at 1 atm.**
322°F = 161°C = 434°K

13.4 **Freezing Point:**
77°F = 25°C = 298°K

13.5 **Critical Temperature:**
662°F = 352°C = 625°K

13.6 **Critical Pressure.**
740 psia = 37 atm = 3.7 MN/m²

13.7 **Specific Gravity:** 0.962 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
34.2 dynes/cm = 0.0342 N/m at 19.2°C

13.9 **Liquid-Water Interfacial Tension.**
39 dynes/cm = 0.0039 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.021

13.12 **Latent Heat of Vaporization:**
[illegible] Btu/lb = [illegible] cal/g = 4.56 × 10⁴ J/kg

13.13 **Heat of Combustion:** 16 000 Btu/lb
8910 cal/g = 373 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 4)

NOTES

REVISED 1978

CCH — CYCLOHEXANONE

Common Synonyms
Cyclohexyl ketone

Watery liquid | Colorless to light yellow | Sweet, peppermint odor

Floats and mixes slowly with water

Fire

Combustible

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Dispersal of ...

2. LABELS

No Hazard Label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Anon
Cyclohexyl ketone
Hexol O
Nadone
Pimelic ketone
Sextone

3 2 **Coast Guard Compatibility Classification:** Ketone

3 3 **Chemical Formula:** $C_6H_{10}O$

3 4 **IMCO United Nations Numerical Designation:** 1915

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to pale yellow

4 3 **Odor:** Like peppermint and acetone

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles

5 2 **Symptoms Following Exposure:** Inhalation of vapors from heated material causes narcosis. The liquid may cause dermatitis

5 3 **Treatment for Exposure:** Immediately flush eyes with plenty of water; call a physician

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 2 LD50 0.5 - 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not voluntarily tolerate moderate to high vapor concentrations

5 9 **Liquid or Solid Characterist** ... Prolonged contact with the skin and eyes may cause burns. Repeated exposure may cause ... Solvent defats the skin

5 10 **Odor Threshold:** 0.12 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 120°F (O.C.) 111°F (C.C.)

6 2 **Flammable Limits in Air:** 1.1 - 9.4

6 3 **Fire Extinguishing Agents.** Use dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 788°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 4.2 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Allied Chemical Corp
Specialty Chemicals Div
Hopewell, Virginia 23860

2 E. I. du Pont de Nemours & Co
Ind. Chem. & Biochemicals Dept
Wilmington, Delaware 19898

3 Monsanto Co
Monsanto Ind. Chemicals Co
800 North Lindbergh Blvd
St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99.8%

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

APQTU

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritat	2
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 98.14

13 3 **Boiling Point at 1 atm:** 312.4°F = 155.8°C = 429.0°K

13 4 **Freezing Point:** -24.2°F = -31.2°C = 242.0°K

13 5 **Critical Temperature:** (739°F = 393°C = 666°K)

13 6 **Critical Pressure:** Saturation Pressure = 3.5 MN/m²

13 7 **Specific Gravity:** 0.948 at 20°C (water)

13 8 **Liquid Surface Tension.** Medium ... N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** 90 dynes/cm = 0.090 N/m at 22.7°C

13 10 **Vapor (Gas) Specific Gravity:** 3.38

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.03

13 12 **Latent Heat of Vaporization:** 207 Btu/lb = 115 cal/g

13 13 **Heat of Combustion:** -15,400 Btu/lb = -8550 cal/g = -358 kJ/g

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued next page

NOTES

REVISED 1978

CHP	# CYCLOHEXANONE PEROXIDE

Common Synonyms	Thick liquid	White	Odorless
1 Hydroperoxycyclohexyl 1 hydroxycyclohexyl peroxide Hydroperoxycyclohexyl hydroxycyclohexyl peroxide Dicyclohexanone diperoxide	Sinks in water		

Fire	Combustible Containers may explode in fire
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. Oxidizing material
Mechanical Treatment
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Hydroperoxycyclohexyl hydroxycyclohexyl peroxide Hydroperoxycyclohexyl hydroxycyclohexyl peroxide, Cadox HDP, Lupersol JDB-50-T Dicyclohexanone diperoxide

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $C_{12}H_{22}O_5$ or $C_{12}H_{20}O_4(OOH)_2$

3 4 **IMCO/United Nations Numerical Designation:** 1 00°1 (> 70%) 5 2 1525 (< 70%)

Continued on page 4

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid or paste

4 2 **Color:** Colorless or white

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves protective clothing

5 2 **Symptoms Following Exposure:** Irritates eyes and skin on contact. Ingestion causes irritation to mouth and stomach

5 3 **Treatment for Exposure:** EYES flush with water for at least 15 min get medical attention SKIN wipe off and wash with soap and water get medical attention if irritation persists INGESTION induce vomiting get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ = 500 mg/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Combustible solid (ASTM D 1929 Ignition Test Method)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** May explode

6 7 **Ignition Temperature** 79° F (dibutyl phthalate)

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Pennwalt Corporation
Lucidol Division
P O Box 1201
Buffalo N Y 14240

Diamond Shamrock Corp.
Agric Chemical Division
1100 Garden Street
Tuscola Illinois 61953

Stauffer Chemical Co
4700 Agard Road
Muskegon Mich 49445

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 45 percent in dibutyl phthalate

10 2 **Storage Temperature:** Cool ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

L E A X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Organic Peroxide

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not given

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid or liquid

13 2 **Molecular Weight:** Mixture

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.45 at 20°C (liquid)

13 8 **Liquid Surface Tension:** (water) 72 dynes/cm = 0.070 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** (water) 40 dynes/cm = 0.040 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** (approximate) -6.8 x 10^3 Btu/lb = -3.8 x 10^3 cal/g = -15.9 x 10^3 J/g

13 14 **Heat of Decomposition:** Data not available

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** None

Continued on page 4

3 CHEMICAL DESIGNATIONS (Cont'd.)

3 4 **IMCO/United Nations Numerical Designation:** 1 00°1 (> 70%) 5 2 1525 (< 70%)

CHT	CYCLOHEXENYLTRICHLOROSILANE

Common Synonyms	Liquid	Colorless	Sharp irritating odor
	Reacts with water. Poisonous gas is produced on contact with water.		

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

GAS PRODUCED IN REACTION WITH WATER
POISONOUS IF INHALED
Irritating to eyes, nose and throat

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Isolate warning contaminate water
Restrict access
Dispose and treat with care

2 LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $C_6H_9SiCl_3$
3.4 **IMCO/United Nations Numerical Designation:** 1760

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sharp irritating odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Avoid eye, skin and respiratory contact. Personal workers goggles, other protective equipment as needed to prevent repeated or prolonged
5.2 **Symptoms Following Exposure:** Inhalation causes irritation and severe burning. Contact with eyes or skin causes severe burns. Ingestion causes severe burning and irritation
5.3 **Treatment for Exposure:** Get medical attention immediately following all exposures. If not breathing, INHALATION give artificial respiration. EYES flush with water for 15 min. SKIN flush with water. INGESTION give large amounts of water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} 2830 mg/kg rats
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Dry chemical, foam
6.4 **Fire Extinguishing Agents Not to be Used:** Water
6.5 **Special Hazards of Combustion Products:** Irritating [illegible]
6.6 **Behavior in Fire:** Polymerization [illegible]
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently with water to form hydrochloric acid and polymerization
7.2 **Reactivity with Common Materials:** Corrosive to metals in presence of moisture. Reacts with moisture to form hydrochloric acid and polymerization
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water. Neutralize with dilute base. Use caution
7.5 **Polymerization:** Will occur
7.6 **Inhibitor of Polymerization:** None known

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Corning
PCR
Wacker Chemie

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Nitrogen blanket
10.4 **Venting:** Pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

XO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 215.6
13.3 **Boiling Point at 1 atm:** >300°F = >422 K
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.21 at 20°C (liquid)
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 1 and 4)

NOTES

CHA — CYCLOHEXYLAMINE

Common Synonyms
Aminocyclohexane
Hexahydroaniline

Liquid | Colorless | Strong fishy odor

Floats and mixes with water

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
Harmful if swallowed

IF IN EYES
IF SWALLOWED
DO NOT INDUCE VOMITING

Water Pollution

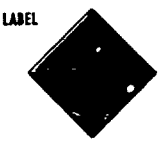
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Aminocyclohexane
Hexahydroaniline

3 2 **Coast Guard Compatibility Classification**
Aliphatic amine

3 3 **Chemical Formula:** $C_6H_{11}NH_2$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Strong fishy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Rubber gloves chemical goggles approved Bureau of Mines respirator for organic vapors

5 2 **Symptoms Following Exposure** Cyclohexylamine is strongly caustic. Inhalation of vapors and contact of liquid with skin and eyes causes severe burns

5 3 **Treatment for Exposure** INGESTION do NOT induce vomiting EYES flush with water for at least 15 min and obtain immediate medical attention SKIN immediately remove contaminated clothing and flush skin with large amounts of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 300 mg m³

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 50 to 500 mg kg

5 7 **Late Toxicity:** Produced cancer of the bladder in the rat.

5 8 **Vapor (Gas) Irritant Characteristics.** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics** Severe skin irritant Causes second and third degree burns on short contact very injurious to the eyes

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 90°F 0 C

6 2 **Flammable Limits in Air:**
Data not available

6 3 **Fire Extinguishing Agents:** Foam carbon dioxide dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 560°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 5 0 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).**
Data not available

8 4 **Food Chain Concentration Potential.**
None

9. SELECTED MANUFACTURERS

1 Abbott Laboratories
Chemical Division
Wichita Kansas 67200

2 Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St Louis Mo 63166

3 Virginia Chemicals Inc
3340 West Norfolk Rd
Portsmouth Virginia 23703

10 SHIPPING INFORMATION

10 1 **Grades or Purity:**
Data not available

10 2 **Storage Temperature:**
Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-P-Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Flammable Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 99 18

13 3 **Boiling Point at 1 atm.**
274 1°F = 134 5°C = 407 7°K

13 4 **Freezing Point:** 0 1°F = −17 7°C = 255 5°K

13 5 **Critical Temperature:**
648°F = 342°C = 615°K

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 865 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
158 Btu lb = 87 6 cal g = 3 67 × 10 J kg

13 13 **Heat of Combustion:** (est) = −18 000 Btu lb
= −10 000 cal g = −420 × 10³ J kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** (est) 4 Btu lb
= −2 cal g = −0 1 × 10³ J kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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CYP CYCLOPENTANE

Common Synonyms

Pentamethylene

Waters liquid | Colorless | Mild, sweet odor

Floats on water Flammable, irritating vapor is produced

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause dizziness, nausea, vomiting, difficult breathing or loss of consciousness

LIQUID
Irritating to skin and eyes
Harmful if swallowed

DO NOT INDUCE VOMITING

Water Pollution

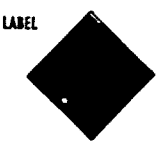
Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Evacuate area
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Pentamethylene
3 2 **Coast Guard Compatibility Classification** Saturated hydrocarbon
3 3 **Chemical Formula:** C_5H_{10}
3 4 **IMCO/United Nations Numerical Designation.** 3 1 1146

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color** Colorless
4 3 **Odor** Like gasoline mild sweet

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Hydrocarbon canister supplied air or hose mask rubber or plastic gloves chemical goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation causes dizziness nausea and vomiting concentrated vapor may cause unconsciousness and collapse Vapor causes slight smarting of eyes Contact with liquid causes irritation of eyes and may irritate skin if allowed to remain Ingestion causes irritation of stomach Aspiration produces severe lung irritation and rapidly developing pulmonary edema central nervous system excitement followed by depression

5 3 **Treatment for Exposure** INHALATION remove to fresh air if breathing stops apply artificial respiration and administer oxygen EYES flush with water for at least 15 min call a physician SKIN flush well with water then wash with soap and water INGESTION do NOT induce vomiting guard against aspiration into lungs ASPIRATION [illegible] bed rest give oxygen, get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** 300 ppm for 60 min

5 6 **Toxicity by Ingestion.** Grade 2 LD$_{50}$ 0 5 to 5 g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** <20°F C C
6 2 **Flammable Limits in Air:** (approx.) LFL 1 4% UFL 8 7%
6 3 **Fire Extinguishing Agents** Dry chemical foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire** Containers may explode
6 7 **Ignition Temperature:** 716°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 7 9 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville Okla 74004

2 Aldrich Chemical Co
940 West St Paul Avenue
Milwaukee Wis 53233

3 Pfaltz & Bauer, Inc
126-04 Northern Boulevard
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades of Purity.** Commercial 60% (remainder consists of hydrocarbons of similar boiling point) Research 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U-A-W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 70 1
13 3 **Boiling Point at 1 atm.** 120 7°F = 49 3°C = 322 5°K
13 4 **Freezing Point:** −137 0°F = −93 9°C = −179 3°K
13 5 **Critical Temperature:** 461 5°F = 238 6°C = 511 8°K
13 6 **Critical Pressure:** 654 psia = 44 4 atm = 4 51 MN/m
13 7 **Specific Gravity:** 0 74 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 23 dynes/cm = 0 023 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** (est.) 28 dynes/cm = 0 028 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** 2 4
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 1217
13 12 **Latent Heat of Vaporization** 170 Btu/lb = 94 cal/g = 3 9 × 10 J/kg
13 13 **Heat of Combustion:** −19 990 Btu/lb = −11,110 cal/g = −465 × 10^3 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CPR	# CYCLOPROPANE

Common Synonyms			
Trimethylene	Liquefied gas	Colorless	Mild sweet odor
	Floats and boils on water	Flammable visible vapor cloud is produced	

Fire	**FLAMMABLE** Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	**VAPOR** If inhaled will cause difficult breathing **LIQUID** Will cause frostbite
Water Pollution	Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Trimethylene
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** C_3H_6
3 4 **IMCO/United Nations Numerical Designation:** 9/1027

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquefied gas
4 2 **Color:** Colorless
4 3 **Odor:** Sweet slightly pungent not irritating characteristic odor, like light petroleum solvent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus for high concentrations of vapor safety goggles or face shield
5 2 **Symptoms Following Exposure:** Inhalation causes some analgesia anesthesia pupil dilation shallow depth of respirations decreasing muscle tone Contact with liquid may cause frostbite
5 3 **Treatment for Exposure:** INHALATION remove promptly to fresh air if symptoms of asphyxiation persist administer artificial respiration and oxygen treat symptomatically thereafter SKIN if frostbite has occurred apply warm water treat burn
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 400 ppm (suggested)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Flammable gas
6 2 **Flammable Limits in Air:** 2.4% - 10.3%
6 3 **Fire Extinguishing Agents:** Shut off flow of gas
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Containers may explode
6 7 **Ignition Temperature:** 932°F
6 8 **Electrical Hazard:** Class I Group C
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** None
8 2 **Waterfowl Toxicity:** None
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Airco Inc
Ohio Medical Products Division
3030 Airco Drive
Madison, Wis 53701

2 Matheson Gas Products Co
East Rutherford, N J 07073

3 Air Products and Chemicals Inc
Specialty Gas Department
P O Box 538
Allentown, Pa 18105

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99.5+% USP
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-B C D E-F G

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas
13 2 **Molecular Weight:** 42.1
13 3 **Boiling Point at 1 atm:** −27.2°F = −32.9°C = 240.3°K
13 4 **Freezing Point:** −197.3°F = −127.4°C = 145.8°K
13 5 **Critical Temperature:** 256.5°F = 124.7°C = 397.9°K
13 6 **Critical Pressure:** 798 psia = 54.2 atm = 5.50 MN/m
13 7 **Specific Gravity:** 0.676 at −33°C (liquid)
13 8 **Liquid Surface Tension:** 22 dynes/cm = 0.022 N/m at −40°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 1.48
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.1790
13 12 **Latent Heat of Vaporization:** 203 Btu/lb = 113 cal/g = 4.73 × 10⁵ J/kg
13 13 **Heat of Combustion:** −21,247 Btu/lb = −11,804 cal/g = −493.88 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

continued on pages 5 and 6

NOTES

CMP p-CYMENE

Common Synonyms			
p-Isopropyltoluene 1-Methyl-4-isopropylbenzene Cymol Methylpropylbenzene Isopropylkresol	Liquid Floats on water	Colorless	Mild pleasant odor

Fire	**Combustible**
Exposure	**LIQUID** **Irritating to skin and eyes**
Water Pollution	Effect of low concentrations on aquatic life unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cymol p-Isopropyltoluene Isopropyltoluol 1-Methyl-4-isopropylbenzene Methyl propyl benzene

3 2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon

3 3 **Chemical Formula:** p-$CH_3C_6H_4CH(CH_3)_2$

3 4 **IMCO/United Nations Numerical Designation:** 33 2046

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild pleasant aromatic solvent type

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained or air-line breathing apparatus, solvent resistant rubber gloves, chemical splash goggles

5 2 **Symptoms Following Exposure:** Inhalation causes impairment of coordination, headache. Contact with liquid causes mild irritation of eyes and skin. Ingestion causes irritation of mouth and stomach

5 3 **Treatment for Exposure:** INHALATION remove victim from contaminated area, administer artificial respiration if necessary, call physician. EYES flush with water for 15 min, call a physician. SKIN wipe off liquid, wash well with soap and water. INGESTION induce vomiting, get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 4.750 mg/kg. Oral human TD_{Lo} (lowest toxic dose) = 56 mg/kg (affects central nervous system)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting of eyes and skin

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 140°F O.C., 117°F C.C.

6 2 **Flammable Limits in Air:** 0.7% - 5.6%

6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 817°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 6.1 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Hercules Incorporated
Organics Department
Wilmington, Del. 19899

2 Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

3 Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** 95+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 134.2

13 3 **Boiling Point at 1 atm:**
352°F = 177°C = 450°K

13 4 **Freezing Point:**
−90.2°F = −67.9°C = 205.3°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.857 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
28.09 dynes/cm = 0.028 N/m at 25°C

13 9 **Liquid-Water Interfacial Tension:**
36.41 dynes/cm = 0.0364 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:**
122 Btu/lb = 67.8 cal/g = 2.84 × 10⁵ J/kg

13 13 **Heat of Combustion:** −18,800 Btu/lb
= −10,440 cal/g = −43.7 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DIP

DALAPON

Common Synonyms
2,2 Dichloropropanoic acid
2,2 Dichloropropionic acid

Liquid | Colorless | Acrid odor

Sinks and mixes with water

[illegible]

Fire

Combustible

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
[illegible]
LIQUID
Will burn skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,2-Dichloropropanoic acid; alpha, alpha-Dichloropropionic acid; 2,2-Dichloropropionic acid
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** CH_3CCl_2COOH
3.4 **IMCO/United Nations Numerical Designation:** 8, 1760

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Acrid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing, including goggles, gloves and boots; self-contained breathing apparatus
5.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of nose, mouth and lungs. Ingestion causes severe irritation of mouth and stomach. Contact with eyes or skin causes irritation and burns.
5.3 **Treatment for Exposure:** INHALATION: move to fresh air; if patient is not breathing, give artificial respiration. Keep patient quiet, get medical attention. INGESTION: give large amounts of water, get medical attention. EYES: flush with water for at least 15 min., get medical attention. SKIN: flush with water, get medical attention if irritation persists.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 3.65 g/kg (mouse); 7.57 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** 2500 mg/m³

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Irritating fumes of hydrochloric acid may form in fire
6.6 **Behavior in Fire:** Volatilizes with steam
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to form hydrochloric and pyruvic acids. The reaction is not hazardous
7.2 **Reactivity with Common Materials:** Very corrosive to aluminum and copper alloys. Flammable and explosive hydrogen gas may form in enclosed spaces
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with dilute sodium bicarbonate or soda ash solution
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 105 ppm/96 hr/bluegill/TL_m/fresh water; 1 ppm/48 hr/brown shrimp/TL_m salt water
8.2 **Waterfowl Toxicity:** > 5,000 ppm LC_{50}
8.3 **Biological Oxygen Demand (BOD):** 0.64 lb/lb/5 days, unacclimated seed; 0.32 lb/lb/5 days, acclimated seed
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical grade 90% solid formulations of sodium and magnesium salts are sometimes referred to as Dalapon and are much less corrosive
10.2 **Storage Temperature:** 70°-90°F
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 143
13.3 **Boiling Point at 1 atm:** 374°F = 190°C = 463°K
13.4 **Freezing Point:** 46°F = 8°C = 281°K
13.5 **Critical Temperature:** Data not available
13.6 **Critical Pressure:** Data not available
13.7 **Specific Gravity:** 1.39 at 23°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4.9
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Data not available
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DDD	DDD

Common Synonyms
TDE
1,1 Dichloro-2,2 bis(p-chlorophenyl) ethane
Dichlorodiphenyldichloroethane

Solid — White

Sinks in water

[illegible] is possible. Keep people away.
Avoid contact with spilled material and dust.
[illegible]
[illegible]

Fire

Combustible
Irritating gases may be produced when heated
[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
Harmful if inhaled
[illegible]

SOLID
Irritating to skin and eyes.
Harmful if swallowed
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1,1 Dichloro-2,2 bis (p-chlorophenyl) ethane, Dichlorodiphenyldichloroethane, TDE

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(4\text{-}ClC_6H_4)_2CHCCl_3$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes vomiting and elevated symptoms similar to those caused by DDT. Contact with eyes causes irritation

5 3 **Treatment for Exposure:** INGESTION: treatment should be given by a physician and is similar to that given following ingestion of DDT. EYES: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1.2 g/kg (mouse); 3.4 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
<2.6 ppm-96 hr catfish TL_m fresh water
0.45 - 0.2 ppm 48 hr brown shrimp TL_m salt water
0.0068 ppm 24 hr brown shrimp LC_{50} salt water

8 2 **Waterfowl Toxicity:** 4,000-5,200 ppm LC_{50}

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** High

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 W. Saint Paul Ave
Milwaukee, Wis. 53233

2 Pfaltz and Bauer, Inc.
375 Fairfield Ave
Stamford, Conn. 06902

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 320

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 234°F = 112°C = 385°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.476 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heat of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DDT	DDT

Common Synonyms
Dichlorodiphenyltrichloroethane
p,p' DDT

Solid | Colorless | Odorless

Sinks in water

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

SOLIDS
Irritating to skin and eyes.
If swallowed will cause nausea, vomiting, headache, or loss of consciousness.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Should be removed

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dichlorodiphenyltrichloroethane
p,p' DDT
1,1,1-Trichloro-2,2-
bis-p-chlorophenylethane

3 2 **Coast Guard Compatibility Classification:**
Not applicable

3 3 **Chemical Formula:**
$(ClC_6H_4)_2CHCCl_3$

3 4 **IMCO United Nations Numerical Designation:** 3

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Data not available

5 2 **Symptoms Following Exposure:** Very large doses are followed promptly by vomiting, diarrhea, local gastric irritation, delayed emesis or diarrhea may occur. With smaller doses, symptoms usually appear 2 hours after ingestion. These include tingling of lips, tongue, and face, malaise, headache, sore throat, fatigue, coarse tremors of neck, head, and eyelids, apprehension, ataxia, and confusion. Convulsions may alternate with periods of coma and partial paralysis. Vital signs are essentially normal, but in severe poisoning, the pulse may be irregular and abnormally slow, ventricular fibrillation and sudden death may occur at any time during acute phase. Pulmonary edema usually indicates solvent aspiration.

5 3 **Treatment for Exposure:** INGESTION: Treatment should be done by a physician. It usually includes gastric lavage and administration of saline cathartic, phenobarbital and parenteral fluids. Patient should be kept quiet and under observation for at least 24 hours.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 3 LD50 to 500 mg/kg (rats)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. Repeated or prolonged contact to remain may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** [illegible] C.C.

6 2 **Flammable Limits in Air:**
Not pertinent

6 3 **Fire Extinguishing Agents:** Water
foam, dry chemical, or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Irritating and poisonous gases may be generated

6 6 **Behavior in Fire:** Melts and burns

6 7 **Ignition Temperature:**
Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.0039 ppm 24 hr TLm fresh water
0.0018 ppm 96 hr TLm fresh water
0.0028 ppm 48 hr TLm shrimp 96% salt water

8 2 **Waterfowl Toxicity:** 2240 mg/kg

8 3 **Biological Oxygen Demand (BOD):**
Not pertinent

8 4 **Food Chain Concentration Potential:**
High

9 SELECTED MANUFACTURERS

1 Lebanon Chemical Corp
Lebanon, Pa. 17042

2 Monsanto Chemical Corp. Co
800 South Vegal Ave
Los Angeles, Calif. 90022

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical

10 2 **Storage Temperature:**
Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
ORM A

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Solid

13 2 **Molecular Weight:** 354.5

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** 226 F = 108°C = 381°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.56 at 15°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

DBR — DECABORANE

Common Synonyms

Solid | White | Sharp odor

Floats on water

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire

Exposure

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
water contaminant: poison
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL





3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $B_{10}H_{14}$
3.4 **IMCO/United Nations Numerical Designation:** 4.1 1868

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** Pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus or positive pressure hose mask; rubber boots or overshoes, clothing made of material resistant to decaborane; rubber gloves; chemical-type goggles or face shield

5.2 **Symptoms Following Exposure:** The onset of symptoms is frequently delayed until one or two days after exposure. Inhalation or ingestion causes headache, nausea, light headedness, drowsiness, nervousness, lack of coordination, and tremor; muscle spasms and generalized convulsions may occur. Dust irritates eyes and skin and may give same systemic symptoms as for inhalation of left on skin

5.3 **Treatment for Exposure:** Get medical attention after all exposures to this compound. Symptoms may be delayed for 48 hours. INHALATION: move patient to fresh air. Keep him warm and quiet. EYES: flush with water for at least 15 min. SKIN: immediately wash with soap and plenty of water. INGESTION: if victim is conscious, give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. *Note to physician:* Treat symptomatically; administration of methocarbamol or other muscle relaxant may be helpful immediately following exposure and in the absence of symptoms

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 40 mg/kg (mouse)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** (Flammable solid) 176°F C.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, and carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Halogenated extinguishing agents

6.5 **Special Hazards of Combustion Products:** May give toxic fumes of unburned material

6.6 **Behavior in Fire:** May explode when hot. Burns with a green-colored flame

6.7 **Ignition Temperature:** 90°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to form flammable hydrogen gas, which can accumulate in closed area

7.2 **Reactivity with Common Materials:** Corrosive to natural rubber, some synthetic rubbers, some greases, and some lubricants

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with 5% aqueous ammonia solution, then with water. Methyl alcohol may also be used

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Callery Chemical Company
Callery, Pa. 16024

2 Atlantic Chemicals Inc.
150 Andover St.
Danvers, Mass. 01923

3 K & K Laboratories Inc.
121 Express Street
Plainview, N.Y. 11803

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 95+%. High purity 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II RR

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 122.3

13.3 **Boiling Point at 1 atm:** 415°F = 213°C = 486°K

13.4 **Freezing Point:** 210°F = 99°C = 372°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.94 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −28,699 Btu/lb = −15,944 cal/g = −66.7 × 10³ J/kg

13.14 **Heat of Decomposition:** −279 Btu/lb = −155 cal/g = −6.49 × 10² J/kg

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 4 and 5)

5 HEALTH HAZARDS (Cont'd.)

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 0.05 ppm

DHN — DECAHYDRONAPHTHALENE

Common Synonyms			
Bicyclo [4.4.0] decane Naphthalane Perhydronaphthalene Dec Decalin	Liquid	Colorless	Turpentine-like odor
	Floats on water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause headache, nausea, or vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bicyclo [4.4.0] decane; Naphthalane; Perhydronaphthalene; Dec; Decalin; Decahydronaphthalene; cis- or trans- Decahydronaphthalene

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_{10}H_{18}$

3.4 **IMCO/United Nations Numerical Designation:** 1.1.1147

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Aromatic, like turpentine, mild characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air mask or self-contained breathing apparatus if in enclosed tank; rubber gloves or protective cream; goggles or face shield

5.2 **Symptoms Following Exposure:** Inhalation or ingestion irritates nose and throat; causes nausea, dizziness, headache, vomiting; urine may become blue; irritates eyes; liquid defats skin and causes cracking and secondary infection; dermatitis develops

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air; if not breathing, give artificial respiration. EYES: flush with water for at least 15 min. SKIN: wash with water and mild soap. INGESTION: give emetic such as warm salt water, followed by a mild cathartic; direct physician to preserve liver and kidney function

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm (suggested)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 4.170 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 134°F C.C.

6.2 **Flammable Limits in Air:** 0.7% - 4.9%

6.3 **Fire Extinguishing Agents:** Water; foam; dry chemical; carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 482°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 5.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Progil Inc
509 Madison Avenue
New York, N.Y. 10022

2 E.I. duPont de Nemours & Co
Organic Chemicals Department
Dyes and Chemicals Division
Wilmington, Del. 19898

3 Eastman Kodak Co
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical mixture of cis-(35%) and trans-(65%) isomers. Properties of all such mixtures are very similar. Spectro grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A.I.I.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification (Numerical Degree — Ascending)
Health Hazard (Blue)	0 2
Flammability (Red)	2 2
Reactivity (Yellow)	0 0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 138.2

13.3 **Boiling Point at 1 atm:** 383°F = 195°C = 468°K

13.4 **Freezing Point:** −44°F = −42°C = 231°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.89 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 30 dynes/cm = 0.030 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 51.5 dynes/cm = 0.0515 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 130 Btu/lb = 71 cal/g = 3.0 × 10⁵ J/kg

13.13 **Heat of Combustion:** −19,200 Btu/lb = −11,700 cal/g = −44 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 4)

NOTES

DAL — DECALDEHYDE

Common Synonyms
Decanal
Caprinaldehyde
Capraldehyde

Liquid Colorless to light yellow Pleasant odor

Floats on water Freezing point is 64°F

Fire

Combustible

Exposure

CAUTION! [illegible]

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Foaming in shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Appendix Methods Handbook CG-446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Aldehyde C-10
Caprinaldehyde
Capric aldehyde
Decanal
n-Decylaldehyde

3.2 **Coast Guard Compatibility Classification:** Aldehyde

3.3 **Chemical Formula:** $C_9H_{19}CHO$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Pleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing and chemical goggles

5.2 **Symptoms Following Exposure:** Ordinarily will produce eye and skin irritation with low general toxicity

5.3 **Treatment for Exposure:** CONTACT WITH EYES AND SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 0; LD_{50} 13.3 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Skin effects thought to be minor

5.10 **Odor Threshold:** 0.168 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 185°F CC

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Givaudan Corp.
Aroma Chemicals Division
Clifton, N.J. 07014

2. International Flavors and Fragrances Inc.
Union Beach, N.J. 07735

3. J. Reiter and Co.
9001 Gaudais Ave.
Los Angeles, California 90045

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

ATI

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:**
28.0 dynes/cm = 0.0280 N/m at 24°C

13.9 **Liquid-Water Interfacial Tension:**
16.9 dynes/cm = 0.0169 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible] vapor and

NOTES

REVISED 1978

DCE	1-DECENE

Common Synonyms: alpha-Decene

Water: Insol
Color: Colorless
Physical state: Liquid
Floats on water

Fire

Combustible

Exposure

CAUTION MATERIAL IS A
LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

Mechanical containment
Should be recovered
Chemical and physical containment

2. LABELS

No label is required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** alpha-Decene
3.2 **Coast Guard Compatibility Classification:** Other
3.3 **Chemical Formula:** $CH_2CHC_8H_{17}$
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild pleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical canister type approved mask, goggles or face shield
5.2 **Symptoms Following Exposure:** Vapors may produce slight irritation of eyes and respiratory tract. Liquid prevents skin respiration. May absorb in high concentrations in high concentration
5.3 **Treatment for Exposure:** CONTACT WITH EYES OR SKIN: splash in the eyes should be [illegible] with plenty of water for at least fifteen minutes. Skin areas should be washed with soap and water. Contaminated clothing should be considered hazardous
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Slight irritation of eyes and respiratory system at high concentrations. Effects are temporary
5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Not reactive
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Gulf Oil Corp.
Gulf Oil Chemicals Co.
Petrochemicals Division
Cedar Bayou, Texas [illegible]

2. The Humphrey Chemical Co.
Devon St.
North Haven, Conn. [illegible]

3. Phillips Petroleum Co.
Bartlesville, Okla. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 95%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG-446-2)

A I I

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 38 dynes/cm = 0.038 N/m at 22.5°C
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

REVISED 1974

DAN	n-DECYL ALCOHOL

Common Synonyms
1-Decanol
Normal decanol
Capric alcohol

Liquid. Colorless to light yellow. Faint alcohol odor.

Floats on water. Freezing point is 44° F.

Fire

Combustible.

Exposure

LIQUID
Irritating to eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Foaming in shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Decanol; Decyl alcohol; Capric alcohol; 1-Decanol; n-Decanol; Normal decanol

3.2 Coast Guard Compatibility Classification: None

3.3 Chemical Formula: $CH_3(CH_2)_8CH_2OH$

3.4 IMCO United Nations Numerical Designation: Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid

4.2 Color: Colorless to slight yellow

4.3 Odor: Faint alcohol

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Negligible hazard

5.2 Symptoms Following Exposure: Irritation of eyes, skin, and respiratory tract

5.3 Treatment for Exposure: CONTACT WITH EYES: Flush with water for 15 minutes

5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent

5.5 Short-Term Inhalation Limits: Not pertinent

5.6 Toxicity by Ingestion: Grade 1 (slightly toxic)

5.7 Late Toxicity: Data not available

5.8 Vapor (Gas) Irritant Characteristics: None

5.9 Liquid or Solid Irritant Characteristics: Not applicable. Not a primary skin irritant

5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 Flash Point: 180°F O.C.

6.2 Flammable Limits in Air: Data not available

6.3 Fire Extinguishing Agents: Dry chemical

6.4 Fire Extinguishing Agents Not to be Used: Not pertinent

6.5 Special Hazards of Combustion Products: Not pertinent

6.6 Behavior in Fire: Not pertinent

6.7 Ignition Temperature: Data not available

6.8 Electrical Hazard: Data not available

6.9 Burning Rate: Data not available

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction

7.2 Reactivity with Common Materials: No reaction

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): 50-95 % in 5 days

8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Computer Chemicals Division
Ethyl Corporation
Baton Rouge, Louisiana
Saddle Brook, New Jersey

The Procter and Gamble Co.
Cincinnati, Ohio

10 SHIPPING INFORMATION

10.1 Grades of Purity: 95% min.

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: No requirement

10.4 Venting: Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

N.H.1

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combustible Liquid

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poison	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid

13.2 Molecular Weight: 158.28

13.3 Boiling Point at 1 atm: 449.1°K = 349.8°F = 176.6°C

13.4 Freezing Point: 44°F = 279.8°K = 6.8°C

13.5 Critical Temperature: 721.1°K = 478.4°F = 448.1°C

13.6 Critical Pressure: 2.1 MN/m² = 305 psia

13.7 Specific Gravity: 0.829 at 20°C/4°C (liquid)

13.8 Liquid Surface Tension: 28.9 dynes/cm = 0.0289 N/m at 20°C

13.9 Liquid-Water Interfacial Tension: 10.0 dynes/cm = 0.010 N/m at 20°C

13.10 Vapor (Gas) Specific Gravity: 5.46

13.11 Ratio of Specific Heats of Vapor (Gas): 1.03

13.12 Latent Heat of Vaporization: 109.8 Btu/lb = 61.0 cal/g = 255.4 x 10³ J/kg

13.13 Heat of Combustion: 19,000 Btu/lb = 9980 cal/g = 418 x 10³ J/kg

13.14 Heat of Decomposition: No information found

13.15 Heat of Solution: No information found

13.16 Heat of Polymerization: No information found

NOTES

REVISED 1978

DBZ — n-DECYLBENZENE

Common Synonyms
1 Phenyldecane
Decylbenzene

Liquid — White

Floats on water

[illegible]

Fire

Combustible

[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Decylbenzene, 1 Phenyldecane
3 2 **Coast Guard Compatibility Classification.** Aromatic hydrocarbon
3 3 **Chemical Formula:** $C_6H_5(CH_2)_9CH_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure** Inhalation of vapor causes slight irritation of nose and throat. Aspiration of liquid into lungs causes coughing, distress, and pulmonary edema. Ingestion causes irritation of stomach. Contact with vapor or liquid causes irritation of eyes and mild irritation of skin.
5 3 **Treatment for Exposure** INHALATION move to fresh air. INGESTION do NOT induce vomiting, call a doctor. EYES flush with water. SKIN wipe off, flush with water, wash with soap and water. ASPIRATION enforce bed rest, administer oxygen, call a doctor.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 225°F C C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products.**
6 6 **Behavior in Fire**
6 7 **Ignition Temperature.** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** 4.04 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 The Humphrey Chemical Co
Devine Street
North Haven, Conn 06473

2 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford, Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 218
13 3 **Boiling Point at 1 atm:** 572°F = 300°C = 573°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 0.855 at 20°C (liquid)
13 8 **Liquid Surface Tension.** 29.95 dynes/cm = 0.02995 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** Data not available
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** 108 Btu/lb = 57.67 cal/g = 2.413×10^5 J/kg
13 13 **Heat of Combustion** −18,400 Btu/lb = −10,200 cal/g = -427×10^5 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DEMETON

Common Synonyms			
O,O-Diethyl O and S-[2 (ethylthio) ethyl] phosphorothioates	Liquid	Yellowish brown	Unpleasant odor
	Sinks in water		

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY

Fire

Solution in a combustible solvent
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
If inhaled will cause headache or difficult breathing

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

IF IN EYES
IF SWALLOWED
IF SWALLOWED

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant, high flammability
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** O,O-Diethyl-O (and S)-[2 (ethylthio) ethyl] phosphorothioates Mixture of O- and S [2 (Ethylthio) ethyl] phosphorothioic acid, O O diethyl ester Systox and rs. systox mixture

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $C_8H_{19}O_3PS_2$ $C_8H_{19}O_3PS$ mixture

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Amber

4 3 **Odor** Offensive sulfur compound odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor respirator in confined areas rubber or latex gloves, splash goggles, rubber boots

5 2 **Symptoms Following Exposure:** Inhalation causes headache vertigo blurred vision lachrymation salivation sweating, muscular weakness and ataxia dyspnea, diarrhea abdominal cramps vomiting coma, pulmonary edema and death Ingestion causes nausea vomiting muscle twitching, coma Contact with eyes or skin causes irritation

5 3 **Treatment for Exposure:** *Speed is essential Call a physician after all overexposure to demeton* INHALATION move to fresh air, if needed, begin artificial respiration INGESTION administer milk water or salt-water and induce vomiting repeatedly EYES flush with water for at least 15 min SKIN flood and wash exposed skin areas thoroughly with water remove contaminated clothing under a shower wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 1 mg/m³

5 5 **Short-Term Inhalation Limits:** 0 5 mg/m³ 30 min

5 6 **Toxicity by Ingestion.** Grade 4 oral LD_{50} = 1 7 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** 111°F C C

6 2 **Flammable Limits in Air** 1 0 % V

6 3 **Fire Extinguishing Agents.** Dry chemical foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective on fire

6 5 **Special Hazards of Combustion Products** Irritating fumes of sulfur dioxide and phosphoric acid may form in fire

6 6 **Behavior in Fire:** Compound may volatilize and form toxic fumes Vapor of solvent is heavier than air and may travel considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** 867° F (xylene solvent)

6 8 **Electrical Hazard** (xylene) Class I, Group D

6 9 **Burning Rate.** 5 8 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** May attack some forms of plastics

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **olymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** 0 1 ppm/2 8 hr bluegill/reduction of enzyme in brain fresh water

8 2 **Waterfowl Toxicity** 1 5 mg/kg

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Chemagro
Division of Bay hem Corp
Kansas City Mo 64120

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 25% 66% solution in xylenes which are combustible solvents

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

4 X-3

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poison Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 258

13 3 **Boiling Point at 1 atm.** >284°F = >140°C = >413°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 1 1 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DES

2,4-D ESTERS

Common Synonyms
Butyl 2,4-Dichlorophenoxyacetate
Isopropyl 2,4-dichlorophenoxy acetate
2,4-Dichlorophenoxyacetic acid butyl ester
2,4-Dichlorophenoxyacetic acid

Liquid | Yellowish brown | Fuel oil like odor

Sinks in water

Stop discharge if possible. Keep people away.
Stop if ignition occurs. Call fire department.
Avoid contact with liquid.
Isolate and remove discarded material.
Notify local health and pollution control agencies.

Fire

Combustible
Irritating gases may be produced when heated
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, carbon dioxide, foam, dry sand.
Water may be ineffective.
Flush area with water.

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (two glasses at most).
Induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting or give anything by mouth.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant.
Should be removed.
Chemical and physical treatment.

2 LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Butoxyethyl 2,4 dichlorophenoxyacetate, Butyl 2,4 dichlorophenoxyacetate, 2,4 Dichlorophenoxyacetic acid butoxyethyl ester, 2,4-Dichlorophenoxyacetic acid butyl ester, 2,4 Dichlorophenoxyacetic acid isopropyl ester, Isopropyl 2,4 dichlorophenoxy acetate

3.2 **Coast Guard Compatibility Classification:** Not listed

(Continued on page 4)

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Brown amber
4.3 **Odor:** May have odor of fuel oil

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Face shield or goggles, rubber gloves
5.2 **Symptoms Following Exposure:** Contact with eyes may cause mild irritation
5.3 **Treatment for Exposure:** INGESTION: if large amounts are swallowed, induce vomiting and get medical help. EYES: flush with plenty of water and see a doctor. SKIN: flush with water, wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 or 3. LD_{50}: 320 - 617 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** > 175°F (C.O.C.)
6.2 **Flammable Limits in Air.** Data not available
6.3 **Fire Extinguishing Agents.** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6.5 **Special Hazards of Combustion Products.** Irritating hydrogen chloride vapor may form in fire
6.6 **Behavior in Fire.**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials** May attack some forms of plastics
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
350 ppm/24 hr/bass, bluegill/50% kill/fresh water
1.0 - 5.0 ppm/96 hr/oyster, 50% shell growth disease/salt water
8.2 **Waterfowl Toxicity:** LD_{50} 2025.0 mg/kg
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Amchem Products Inc, Brookside Ave, Ambler, Pa 19002
2. Chipman Division of Rhodia Inc, 23 Belmont Drive, Somerset, N J 08873
3. The Dow Chemical Co, Midland, Mich 48640

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 99%, 64% in petroleum oil
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 234 - 291
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point.** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.088 - 1.237 at 20°C (liquid)
13.8 **Liquid Surface Tension** Data not available
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Data not available
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and A

3 CHEMICAL DESIGNATIONS (Cont'd)

3.3 **Chemical Formula.**
2,4 $Cl_2C_6H_3OCH_2COOR$, where
R = C_4H_9, C_3H_7 or $CH_3CHOC_3H_7$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

DTS — DEXTROSE SOLUTION

Common Synonyms
Glucose solution
Corn sugar solution
Grape sugar solution

Watery liquid | Colorless | Odorless

Sinks and mixes with water

Fire

Nonflammable

Exposure

Not harmful

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Dispersal and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.**
Corn sugar solution
Glucose solution
Grape sugar solution

3 2 **Coast Guard Compatibility Classification:**
Miscellaneous water solutions

3 3 **Chemical Formula:**
$C_6H_{12}O_6$ H_2O

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Clear colorless

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** None needed

5 2 **Symptoms Following Exposure:** Nontoxic

5 2 **Treatment for Exposure:** None needed

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** None

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** None

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:**
Not flammable

6 3 **Fire Extinguishing Agents:**
Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
53% 5 days, 99% (theor) 5 days

8 4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1 CPC International Inc
Argo IL 60501

2 A E Staley Mfg Co
Decatur IL 62525

3 Standard Brands Inc
Clinton Corn Processing Division
Clinton Iowa 52732

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 65 69% solids

10 2 **Storage Temperature:** 130 to 145 F

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 . **Code of Federal Regulations.**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm.**
>212 F = >100 C = >373 K

13 4 **Freezing Point:** <32 F = <0 C = <273 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (est.) 1.20 at 20°C (liquid)

13 8 **Liquid Surface Tension.**
(est.) 60 dynes/cm = 0.06 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization.**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

DAA DIACETONE ALCOHOL

Common Synonyms
4-Hydroxy-4-methyl-2 pentanone
Diacetone

Watery liquid Colorless to light yellow mild pleasant odor

Floats and mixes with water

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diacetone
4 Hydroxy-4 methyl
2 pentanone
Tyranton

3 2 **Coast Guard Compatibility Classification:** Alcohol

3 3 **Chemical Formula:** $CH_3COHCH_2COCH_3$

3 4 **IMCO/United Nations Numerical Designation** 33 1148

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless to yellow

4 3 **Odor** Mild pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Air pack or organic canister rubber gloves goggles

5 2 **Symptoms Following Exposure:** Vapor is irritating to the mucous membrane of the eye and respirators tract Inhalation can cause dizziness nausea some anesthesia Very high concentrations have a narcotic effect The liquid is not highly irritating to the skin but can cause dermatitis

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air Give artificial respiration if breathing has stopped CONTACT WITH EYES OR SKIN wash affected skin areas with water flush eyes with water and get medical aid if discomfort persists

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm

5 5 **Short-Term Inhalation Limits.** 150 ppm for 30 min

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0 stc 5 g kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation exposed personnel will find high concentrations unpleasant The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 142°F O C 12°F C C

6 2 **Flammable Limits in Air:** 1 8% 6 9%

6 3 **Fire Extinguishing Agents:** Dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** 1118 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Celanese Corp
Celanese Chemical Co Division
245 Park Ave
New York N Y 10017

2 Shell Chemical Co
Industrial Chemicals Division
Houston Texas 77001

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 0%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requiremen

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 116 16

13 3 **Boiling Point at 1 atm:** 336 6°F = 169 2°C = 442 4°K

13 4 **Freezing Point:** −45 0°F = −42 8°C = 230 4°K

13 5 **Critical Temperature:** 633°F = 334°C = 607°K

13 6 **Critical Pressure** 580 psia = 39 atm = 3 9 MN m

13 7 **Specific Gravity:** 0 93 at 59°C (liquid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 052

13 12 **Latent Heat of Vaporization:** 190 Btu lb = 88 cal g = 3 6 × 10 J kg

13 13 **Heat of Combustion.** (est) = −13 000 Btu lb = −7 250 cal g = −303 × 10 J kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(See next page)

NOTES

REVISED 1978

DAP	# Di-n-AMYL PHTHALATE

Common Synonyms
Phthalic acid dipentyl ester
Diamyl phthalate
Phthalic acid diamyl ester
Dipentyl phthalate

Liquid | Wate | Odorless

Floats on water

Fire

Combustible

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, coughing or difficult breathing

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diamyl phthalate Dipentyl phthalate Phthalic acid, diamyl ester, Phthalic acid, dipentyl ester

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_6H_4(COOC_5H_{11})_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation of vapors from very hot material may cause headache drowsiness, and convulsions Hot vapors may irritate eyes

5 3 **Treatment for Exposure:** INHALATION move to fresh air EYES flush with water SKIN wipe off flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Causes birth defects in rats (skeletal and gross abnormalities)

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 245°F C C

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents:** Foam dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:**

9. SELECTED MANUFACTURERS

1 Eastman Organic Chemicals
Rochester, N Y 14650

2 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford, Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 306

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.82 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 31.5 dynes/cm = 0.0315 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 140 Btu/lb = 76 cal/g = 3.2×10^5 J/kg

13 13 **Heat of Combustion:** −13,900 Btu/lb = −7 720 cal/g = -323×10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DZN DIAZINON

Common Synonyms

0 0-Diethyl 0-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate
0 0-Diethyl 0-(2-isopropyl-4-methyl-6-pyrimidyl) thiophosphate
Alfa-tox Spectracide Sarolex

Liquid — Light to dark brown

Sinks in water

[illegible] discharge if possible. Keep [illegible]

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

[illegible] AT FOR MEDICAL AID
LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant, high flammability (if solution)
Restrict access
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Coast Guard Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** O O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate; O O-Diethyl O-2-isopropyl-4-methyl-6-pyrimidyl thiophosphate; Diethyl 2-isopropyl-4-methyl-6-pyrimidyl thionophosphate; Alfa-tox, Sarolex, Spectracide

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_{12}H_{21}N_2O_3PS$

3 4 **IMCO/United Nations Numerical Designation:** 6.1 [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or liquid solution

4 2 **Color:** Amber to dark brown

4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure:** Ingestion or prolonged inhalation of mist causes headache, giddiness, blurred vision, nervousness, weakness, cramps, diarrhea, discomfort in the chest, sweating, miosis, tearing, salivation and other excessive respiratory tract secretion, vomiting, cyanosis, papilledema, uncontrollable muscle twitches, convulsions, coma, loss of reflexes, and loss of sphincter control. Liquid irritates eyes and skin.

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air, keep warm, get medical attention at once. EYES: flush with plenty of water for at least 15 min. and get medical attention. SKIN: wash contaminated area with soap and water. INGESTION: get medical attention at once, give water slurry of charcoal. Do NOT give milk or alcohol.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} = 76 mg/kg (rat)

5 7 **Late Toxicity:** May be [illegible]

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 82 - 10°F C.C. (solutions only, pure liquid difficult to burn)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** (for solutions) Foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Oxides of sulfur and of phosphorus are generated in fires

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** (for solutions) 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.025 ppm, 96 hr, stonefly nymph/TL_m/fresh water
30 g/1/48 hr, Bluegill/TL_m/fresh water (becomes bound to soil when used according to directions)

8 2 **Waterfowl Toxicity:**
LD_{50} = 3.54 mg/kg
LC_{50} = 5 days, 90 ppm, mallard duck
LC_{50} = 7 days, 68 ppm, quail

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

Ciba-Geigy Corporation
Agricultural Division
P. O. Box 11422
Greensboro, N. C. 27409

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, wettable powders, a variety of emulsifiable solutions in combustible solvents

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM-A

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 304.4

13 3 **Boiling Point at 1 atm:** Very high, decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.117 at 20°C (liquid)

13 8 **Liquid Surface Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) = -12,000 Btu/lb = -6,500 cal/g = -270 × 10^3 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and A

NOTES

DPO — DIBENZOYL PEROXIDE

Common Synonyms			
Benzoyl peroxide Benzoyl superoxide Lucidol Oxylite BPO BP	Solid powder or granules	White	Odorless
	Sinks in water		

[illegible]

Fire

FLAMMABLE.
MAY EXPLODE IF SUBJECTED TO HEAT, SHOCK OR FRICTION
May cause fire and explode on contact with combustibles

[illegible]

Exposure

[illegible] FOR MEDICAL AID
SOLID
Irritating to skin and eyes
Harmful if swallowed

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning - high flammability
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**

Benzoyl peroxide	BPO
Benzoyl superoxide	Lucidol 70
BP	Oxylite

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:**

$(C_6H_5CO)_2O_2$

3 4 **IMCO United Nations Numerical Designation:** 5 2 1521

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety goggles, face shield, rubber gloves

5 2 **Symptoms Following Exposure:** CONTACT WITH EYES OR SKIN irritates eyes. Prolonged contact may irritate skin

5 3 **Treatment for Exposure:** INGESTION: administer an emetic to induce vomiting and call a physician. CONTACT WITH EYES OR SKIN: do not use oils or ointments; flush eyes with plenty of water and get medical attention; wash skin with plenty of soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2 LD₅₀ 0.5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Highly flammable solid explosion sensitive to shock, heat and friction

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Difficult to extinguish once ignited. Use water spray to cool surrounding area

6 4 **Fire Extinguishing Agents Not to be Used:** Do not use hand extinguishers

6 5 **Special Hazards of Combustion Products:** Suffocating smoke evolved

6 6 **Behavior in Fire:** May explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Special care must be taken to avoid contamination with combustible materials (wood, paper, etc.). Various inorganic and organic acids, alkalies, alcohols, amines, easily oxidizable materials such as ethers, or materials used as accelerators in polymerization reactions

7 3 **Stability During Transport:** Extremely explosion sensitive to shock, impact, blows, heat, and friction. May be reported to explode for apparently no specific reason. Self reactive

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Pennwalt Corp
   Lucidol Division
   1740 Military Rd
   Buffalo, N.Y. 14240
2. Reichhold Chemicals, Inc.
   Specialty Chemicals Division
   Austin, Texas 78712
3. Witco Chemical Corp.
   U.S. Peroxygen Division
   850 Marlow Ave.
   Richmond, Calif. 94804

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98% (dry)
70-78% (wet) various grades of dibenzoyl peroxide and liquid plasticizers such as tricresyl phosphate, silicone oil

10 2 **Storage Temperature:** 65-85°F

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Organic Peroxide

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	1
	OX

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 242.22

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** 217°F = 103°C = 376°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.334 at 0°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

REVISED 1978

DBA	# Di-n-BUTYLAMINE

Common Synonyms	Liquid	Colorless	Weak ammonia fishy odor
Dibutylamine 1-Butanamine, N-butyl-	Floats and mixes with water		

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause headache, coughing or difficult breathing LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning
Restrict access
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1-Butanamine, N-butyl
Dibutylamine

3 2 **Coast Guard Compatibility Classification:** Aliphatic amine

3 3 **Chemical Formula:** $(C_4H_9)_2NH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Weak ammonia fishy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose, throat and lungs, coughing, nausea, headache. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Contact with skin causes irritation and dermatitis.

5 3 **Treatment for Exposure:** INHALATION: move from exposure, if breathing has stopped, start artificial respiration. INGESTION: give large amount of water. EYES: irrigate with water for 15 min., get medical attention for possible eye damage. SKIN: wash with large amounts of water for 15 min.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 500 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact at 10 years, injurious to the eyes.

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 125°F O C

6 2 **Flammable Limits in Air:** 1 1% (LEL)

6 3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 3.84 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May corrode some metals and attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibition of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

2 Pennwalt Corporation
Three Parkway
Philadelphia, Pa 19102

3 Virginia Chemicals, Inc
340 West Norfolk Road
Portsmouth, Va 23703

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

N T I

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 129.25

13 3 **Boiling Point at 1 atm:** 419.1°F = 159.6°C = 432.8°K

13 4 **Freezing Point:** −80°F = −62°C = 211°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.759 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 24.76 dynes/cm = 0.02476 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4.5

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 130 Btu/lb = 72.3 cal/g = 3.03 × 10⁵ J/kg

13 13 **Heat of Combustion:** −18,360 Btu/lb = −10,440 cal/g = −436.6 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5-DBA

NOTES

DBE — DI-n-BUTYL ETHER

Common Synonyms

n-Dibutyl ether
n-Butyl ether
butyl ether
1-Butoxybutane
Dibutyl ether

Liquid | Colorless | Mild pleasant odor

*Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.

LIQUID
Irritating to skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABELS

No label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Dibutyl ether; n-Butyl ether; Butyl ether; 1-Butoxybutane; Dibutyl ether; Dibutyl oxide

3.2 **Coast Guard Compatibility Classification:** Ethers (1)

3.3 **Chemical Formula:** $C_8H_{18}O$

3.4 **IMCO/United Nations Numerical Designation:** 3.3/1149

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)*:** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild, etherlike

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Liquid irritates eyes and may irritate skin on prolonged contact. Ingestion causes irritation of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: after contact with liquid flush with water for at least 15 min. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1; oral LD_{50} = 4000 mg/kg (rats)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 92°F O.C.

6.2 **Flammable Limits in Air:** 1.5% - 7.6%

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.

6.7 **Ignition Temperature:** 382°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity*:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)*:** Data not available

8.4 **Food Chain Concentration Potential*:** None

9 SELECTED MANUFACTURERS

1. Publicker Industries Inc.
1429 Walnut Street
Philadelphia, Pa. 19102

2. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

3. MC/B Manufacturing Chemists
2909 Highland Ave.
Norwood, Ohio 45212

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NTU

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 130.2

13.3 **Boiling Point at 1 atm:** 288°F = 142°C = 415°K

13.4 **Freezing Point:** −139.7°F = −95.4°C = 177.8°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.76 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 23 dynes/cm = 0.023 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 10 dynes/cm = 0.010 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0434

13.12 **Latent Heat of Vaporization:** 120 Btu/lb = 68 cal/g = 2.8 × 10⁵ J/kg

13.13 **Heat of Combustion:** −17,670 Btu/lb = −9,820 cal/g = −411 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DBK — Di-n-BUTYL KETONE

Common Synonyms
5-Nonanone

Liquid — Colorless to light yellow

Floats on water
Freezing point is 21°F

Fire

Combustible

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 5-Nonanone
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $CH_3(CH_2)_3COCH_2(CH_2)_3CH_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** White to light yellow
4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, goggles or face shield
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air, administer artificial respiration if needed. EYES: flush with water for at least 15 min. SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Eastman Organic Chemicals
343 State Street
Rochester, N.Y. 14650

2 Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

3 Pfaltz and Bauer, Inc.
375 Fairfield Ave.
Stamford, Conn. 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NRT

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 142
13 3 **Boiling Point at 1 atm:** 370°F = 188°C = 461°K
13 4 **Freezing Point:** 21°F = −6°C = 267°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.822 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 26.60 dynes/cm = 0.0266 N/m at 21.1°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
3 12 **Latent Heat of Vaporization:** 160 Btu/lb = 89.0 cal/g = 3.75 × 10⁵ J/kg
13 13 **Heat of Combustion:** 16,050 Btu/lb = 8,930 cal/g = 37.4 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DBT — DIBUTYLPHENOL

Common Synonym			
2,6-Di-tert-butylphenol	Solid or liquid	Colorless to light yellow	Odorless
	Floats on water. Freezing point is 97°F		

Fire	Combustible
Exposure	LIQUID OR SOLID Will burn skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,6-Di-tert-butylphenol
3.2 **Coast Guard Compatibility Classification:** Phenols (15)
3.3 **Chemical Formula:** 2,6-t-$C_4H_9C_6H_2OH$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid
4.2 **Color:** Colorless to light straw
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Irritates eyes and on prolonged contact skin. Ingestion causes irritation of mouth and stomach
5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off and wash well with soap and water. INGESTION: induce vomiting, get medical attention
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} (2,6-Di-tert-butylphenol) = 1.32 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** >200°F OC
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Ethyl Corporation
Industrial Chemicals Division
Ethyl Tower
451 Florida
Baton Rouge, La. 70801
2. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650
3. Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient (solid) 100°F (liquid)
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V T I H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 206.3
13.3 **Boiling Point at 1 atm:** 497°F = 258°C = 529 K
13.4 **Freezing Point:** 97°F = 36°C = 309 K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.913 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** -17,100 Btu/lb = -9,500 cal/g = -410 x 10^3 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

DPA	DIBUTYL PHTHALATE

Common Synonyms
DBP
Butyl stabilizer
Phthalic acid dibutyl ester

Oily liquid | Colorless | Odorless

Sinks slowly in water

Fire

Combustible

Exposure

LIQUID
No appreciable harm

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: DBP
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
1	
Health	
Vapor Hazard	
Liquid or Solid Hazard	
Fire	
Water Pollution	
Aquatic Toxicity	
Waterfowl Toxicity	
Biological Oxygen Demand	
Reactivity	
Chemical Reactivity	
Water	
Special Hazard	

12.3 NFPA Hazard Classifications:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

REVISED 1978

DBO	o-DICHLOROBENZENE

Common Synonyms			
1,2-Dichlorobenzene Orthodichlorobenzene	Liquid Sinks in water	Colorless	Pleasant odor

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
1,2-Dichlorobenzene
Dowtherm E
Orthodichlorobenzene

3.2 **Coast Guard Compatibility Classification:**
Halogenated hydrocarbon

3.3 **Chemical Formula:**

3.4 **IMCO United Nations Numerical Designation:**

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:**

4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:**

5.2 **Symptoms Following Exposure:**

5.3 **Treatment for Exposure:** INHALATION

5.4 **Toxicity by Inhalation (Threshold Limit Value):**

5.5 **Short-Term Inhalation Limits:**

5.6 **Toxicity by Ingestion:**

5.7 **Late Toxicity:** Causes kidney and liver damage in rats. Effects unknown in humans

5.8 **Vapor (Gas) Irritant Characteristics:**

5.9 **Liquid or Solid Irritant Characteristics:**

5.10 **Odor Threshold:**

6 FIRE HAZARDS

6.1 **Flash Point:**

6.2 **Flammable Limits in Air:**

6.3 **Fire Extinguishing Agents:**

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:**

6.8 **Electrical Hazard:**

6.9 **Burning Rate:**

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:**

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:**

7.4 **Neutralizing Agents for Acids and Caustics:**

7.5 **Polymerization:**

7.6 **Inhibitor of Polymerization:**

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**

8.2 **Waterfowl Toxicity:**

8.3 **Biological Oxygen Demand (BOD):**

8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Technical 99% ortho, 1% para + meta
Technical 85% ortho, 15% para + meta
Technical 50% ortho, 50% para + meta
Pure, not less than 99.5% ortho, not more than 0.5% para

10.2 **Storage Temperature:**
Data not available

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Reactivity	
Water Pollution	
Other Characteristics	

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard	
Flammability	
Reactivity	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:**

13.3 **Boiling Point at 1 atm:**

13.4 **Freezing Point:**

13.5 **Critical Temperature:**

13.6 **Critical Pressure:**

13.7 **Specific Gravity:**

13.8 **Liquid Surface Tension:**

13.9 **Liquid-Water Interfacial Tension:**

13.10 **Vapor (Gas) Specific Gravity:**

13.11 **Ratio of Specific Heats of Vapor (Gas):**

13.12 **Latent Heat of Vaporization:**

13.13 **Heat of Combustion:**

13.14 **Heat of Decomposition:**

13.15 **Heat of Solution:**

13.16 **Heat of Polymerization:**

10 SHIPPING INFORMATION (Cont'd)

10.3 **Inert Atmosphere:**

10.4 **Venting:** Data not available

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DBP	p-DICHLOROBENZENE

Common Synonyms
Paradichlorobenzene
Dichlorocide
Paradi

Solid crystals | White to clear | Mothballs odor

Sinks in water

Avoid contact with solid
and liquid
Isolate and remove
Notify

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Wear
Extinguish with water
Cool

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove
Flush
EYES
SWALLOWED
CONSCIOUS

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Issue warning
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Dichlorocide — Paradow
Paradi — Paramoth
Para dichlorobenzene — Santochlor

3 2 **Coast Guard Compatibility Classification**
Halogenated hydrocarbon

3 3 **Chemical Formula:** p-$C_6H_4Cl_2$

3 4 **IMCO/United Nations Numerical Designation:** 9 0 1592

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Full face mask fitted with organic vapor canister for concentrations over 75 ppm; skin protective clothing; eye protection

5 2 **Symptoms Following Exposure** INHALATION irritation of upper respiratory tract; over exposure may cause depression and injury to liver and kidney EYE CONTACT pain and mild irritation

5 3 **Treatment for Exposure** INHALATION if any ill effect develop remove patient to fresh air and get medical attention If breathing stops
EYES flush with plenty
If irritation or other effects develop SKIN AND INGESTION no problem
toxicity

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 75 ppm

5 5 **Short-Term Inhalation Limits:** 50 ppm for 60 min

5 6 **Toxicity by Ingestion** Grade 2 LD$_{50}$ 0 5 to 5 g/kg

5 7 **Late Toxicity.** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapors cause mode
and high concentrations unpleasant The effects
temporar

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold** 1 to 30 ppm

6 FIRE HAZARDS

6 1 **Flash Point** 150 F O C 150 F C C

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents** Water
foam carbon dioxide or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products**
Vapors are irritating Toxic chlorine
hydrogen chloride and phosgene gases
may be generated in fires

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:**
Data not available

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** 1 3 mm min (approx)

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
50 ppm / fish lethal fresh water
580 mg l 48 hr rainbow trout Hm fresh water
**Toxic effect specified

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
Data not available

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland Mich 48640

2 PPG Industries Inc
Industrial Chemical Division
New Martinsville W Va 26155

3 Standard Chlorine Chemical Co
1019 28 Belleville Turnpike
Kearny N J 07032

10 SHIPPING INFORMATION

10 1 **Grades or Purity.** Solid
99 grades chemical purity close to 100
Liquid 1 2 orthodichlorobenzene

10 2 **Storage Temperature**
Data not available

10 3 **Inert Atmosphere** Data not available

10 4 **Venting.** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
GRM A

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm**
Solid

13 2 **Molecular Weight:** 147 0

13 3 **Boiling Point at 1 atm**
345 6 F = 174 2 C = 447 4 K

13 4 **Freezing Point:** 130 1 F = 53 C = 326 K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity.** 1 458 at 20 C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on back

NOTES

REVISED 1978

DZP	DI-(p-CHLOROBENZOYL) PEROXIDE

Common Synonyms

Bis-(p-chlorobenzoyl) peroxide
p-Chlorobenzoyl peroxide
p,p'-Chlorobenzoyl peroxide
Di-(4-chlorobenzoyl) peroxide

Solid or paste | White | Odorless

Sinks in water

[illegible]

Fire

May explode on contact with combustibles
POISONOUS GASES ARE PRODUCED IN FIRE
[illegible]

Exposure

[illegible]
SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect at low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - oxidizing material
water contaminant
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Bis (p-chlorobenzoyl) peroxide, p-Chlorobenzoyl peroxide, p,p'-Dichlorobenzoyl peroxide, Di (4-chlorobenzoyl) peroxide, Cadox PS

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula.** $(p\text{-}ClC_6H_4COO)_2$

3 4 **IMCO/United Nations Numerical Designation:** 1/0149 (> 78%) 5.2 (54) (> 10% water or > 30% water)

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid or paste in silicone fluid and dibutyl phthalate

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure:** Irritates eyes and (on prolonged contact) skin. Ingestion causes irritation of mouth and stomach

5 3 **Treatment for Exposure:** EYES wash with water for at least 15 min., consult a doctor. SKIN wash with soap and water. INGESTION induce vomiting and call a doctor

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air.** Not pertinent

6 3 **Fire Extinguishing Agents:** Flood with water or use dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic chlorinated biphenyls are formed in fires

6 6 **Behavior in Fire:** Solid may explode. Burns very rapidly when ignited. Smoke is unusually heavy when paste form is involved

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May react vigorously with combustible materials

7 3 **Stability During Transport** Stable if below 80°F

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** Data not available

9. SELECTED MANUFACTURERS

Noury Chemical Corp
Burt, New York 14028

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Dry, wet with more than 20% water, 50% paste with silicone fluid

10 2 **Storage Temperature:** Below 80°F

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Organic Peroxide

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 311.1

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** > 1.1 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** (est.) −9 000 Btu/lb = −5 000 cal/g = −210 × 10⁵ J/kg

13 14 **Heat of Decomposition.** Data not available

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DCB — DICHLOROBUTENE

Common Synonyms

1,4-Dichloro-2-butene
2-Butylene dichloride
1,4-Dichloro-2-butylene
cis-1,4-dichloro-2-butene
trans-1,4-dichloro-2-butene

Liquid | Colorless | Sweet odor

Sinks and mixes slowly with water

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,4-Dichloro-2-butene; 2-Butylene dichloride; 1,4-Dichloro-2-butylene; cis-1,4-Dichloro-2-butene; trans-1,4-Dichloro-2-butene

3.2 **Coast Guard Compatibility Classification:** Halogenated compounds (5)

3.3 **Chemical Formula:** $ClCH_2CH{=}CHCH_2Cl$

3.4 **IMCO/United Nations Numerical Designation:** 8, 1760

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic, sweet, pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves; chemical splash goggles; rubber boots and apron; barrier cream; organic canister mask

5.2 **Symptoms Following Exposure.** Inhalation of vapor irritates nose and throat. Contact with eyes causes intense irritation and tears. Contact of liquid with skin causes severe blistering and dermatitis. Ingestion causes severe irritation of mouth and stomach.

5.3 **Treatment for Exposure.** INHALATION: remove from exposure, provide low pressure oxygen if required, keep under observation until edema is ruled out. EYES: irrigate immediately for 15 min., call physician. SKIN: wash immediately and thoroughly with soap and water, treat as a chemical burn. INGESTION: induce vomiting, call physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Grade 3; oral LD_{50} (1,4-dichloro-2-butene) = 85 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Water fog, foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Decomposition vapors contain phosgene and hydrogen chloride gases, both are toxic and irritating

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature.** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 2.6 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to form hydrochloric acid

7.2 **Reactivity with Common Materials:** Corrodes metal when wet

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Petro-Tex Chemical Corporation
   8600 Park Place Boulevard
   Houston, Texas 77017
2. Pfaltz and Bauer, Inc.
   126-04 Northern Boulevard
   Flushing, N.Y. 11368
3. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Cis/trans equilibrium mixture 98+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A.X.Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight.** 125.0

13.3 **Boiling Point at 1 atm:** 313°F = 156°C = 429°K

13.4 **Freezing Point:**
cis: −53°F = −48°C = 225°K
trans: 37.5°F = 3°C = 276°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 1.112 at 20°C (liquid)

13.8 **Liquid Surface Tension.** (est.)
24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.)
30 dynes/cm = 0.030 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0974

13.12 **Latent Heat of Vaporization:** (est.)
130 Btu/lb = 73 cal/g = 3.1×10^5 J/kg

13.13 **Heat of Combustion.** $-7.5(0)$ Btu/lb = -9.720 cal/g = $-40^{+} \times 10^{5}$ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

DCF — DICHLORODIFLUOROMETHANE

Common Synonyms
Arcton 6
Eskimon 12
F-12
Freon 12
Genetron 12
Isotex 12

Compressed gas | Colorless | Faint odor

Visible vapor cloud is produced

Ship in Tank Cars or Trucks
Notify Local Health and Fire Departments

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

VAPOR
Not irritating to eyes nose or throat
If inhaled will cause dizziness difficult breathing
Move victim to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

Water Pollution

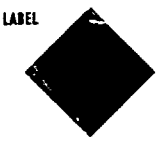
Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Dissipate and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Eskimon 12 Genetron 12 F-12 Halon 122 Freon 12 Isotex 12 Frigen 12 Arcton 12

3 2 **Coast Guard Compatibility Classification** Halogenated hydrocarbon

3 3 **Chemical Formula** CCl_2F_2

3 4 **INCO and United Nations Numerical Designation.** 2.0 1028

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquefied compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** Odorless slight characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Rubber gloves monogoggles

5 2 **Symptoms Following Exposure** INHALATION some narcosis when 10% in air is breathed

5 3 **Treatment for Exposure:** Remove patient to uncontaminated area and apply artificial respiration if breathing has stopped call a physician and if indicated oxygen is to be given

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not listed

5 5 **Short-Term Inhalation Limits** 4000 ppm for 60 min

5 6 **Toxicity by Ingestion:** Not pertinent

5 7 **Late Toxicity** None

5 8 **Vapor (Gas) Irritant Characteristics.** None except at very high concentrations which may irritate lungs

5 9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard Practically harmless to the skin because it is very volatile and evaporates quickly

5 10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Nonflammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Although nonflammable dissociation products generated in a fire may be irritating or toxic

6 6 **Behavior in Fire:** Helps extinguish fire

6 7 **Ignition Temperature.** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Not pertinent

8 2 **Waterfowl Toxicity:** Not pertinent

8 3 **Biological Oxygen Demand (BOD)** Not pertinent

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Division
Baton Rouge, La. 70821

2 E. I. du Pont de Nemours & Co. Inc.
Freon Products Division
Wilmington, Del. 19898

3 Pennwalt Corp
Chemical Division
Calvert City, Ky. 42029

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99.5% (vol.)

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

ACEJ

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Nonflammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Gas

13 2 **Molecular Weight** 120.91

13 3 **Boiling Point at 1 atm.** −21.6°F = −29.8°C = 243.4°K

13 4 **Freezing Point:** −251.0°F = −157.2°C = 115.9°K

13 5 **Critical Temperature** 233.2°F = 111.8°C = 385.0°K

13 6 **Critical Pressure** 596 psia = 40.7 atm = 4.12 MN/m²

13 7 **Specific Gravity:** 1.38 at 5°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4.2

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.129

13 12 **Latent Heat of Vaporization** 140 Btu/lb = 77.9 cal/g = 3.26 × 10⁵ J/kg

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on next page)

NOTES

REVISED 1978

DEL

1,2-DICHLOROETHYLENE

Common Synonyms

Acetylene dichloride
sym-dichloroethylene
Dioform
cis-1,2-dichloroethylene
trans-1,2-dichloroethylene

Liquid | Colorless | Sweet pleasant odor

Sinks in water. Flammable irritating vapor is produced

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
If inhaled will cause dizziness, nausea, vomiting, or difficult breathing

LIQUID
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Evacuate area
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Acetylene dichloride; sym-Dichloroethylene; Dioform; cis- or trans-1,2-Dichloroethylene

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** CHCl=CHCl

3 4 **IMCO/United Nations Numerical Designation:** 3 2 1150

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Ethereal, slightly acrid, pleasant, chloroform-like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, safety goggles, or supply mask or self-contained breathing apparatus

5 2 **Symptoms Following Exposure:** Inhalation causes nausea, vomiting, weakness, tremor, epigastric cramps, central nervous depression. Contact with liquid causes irritation of eyes and (on prolonged contact) skin. Ingestion causes slight depression to deep narcosis.

5 3 **Treatment for Exposure:** INHALATION: remove from further exposure; if breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration, preferably mouth-to-mouth; give oxygen when breathing is resumed; call a physician. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give gastric lavage and cathartics.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 770 mg/kg (rat)

5 7 **Late Toxicity:** Produces liver and kidney injury in experimental animals

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 36°F C.C.

6 2 **Flammable Limits in Air:** 9.7% - 12.8%

6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Phosgene and hydrogen chloride fumes may form in fires

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 2.6 mm/min

7 CHEMICAL REACTIVITY

Reactivity with Water: No reaction

Reactivity with Common Materials: No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Will not occur under ordinary conditions of shipment. The reaction is not vigorous.

7 6 **Inhibitor of Polymerization:** None used

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

2 Dynamit Nobel AG
109 Stonehurst Court
Northvale, N.J. 07647

3 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X X Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 97.0

13 3 **Boiling Point at 1 atm:**
cis: 140°F = 60°C = 333°K
trans: 118°F = 48°C = 321°K

13 4 **Freezing Point:**
cis: -114°F = -81°C = 192°K
trans: -58°F = -50°C = 223°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 1.2 at 25°C (liquid)

13 8 **Liquid Surface Tension:**
24 dynes/cm = 0.024 N/m at 29°C

13 9 **Liquid-Water Interfacial Tension.** (est.)
30 dynes/cm = 0.030 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 3.34

13 11 **Ratio of Specific Heats of Vapor (Gas)**
1.1468

13 12 **Latent Heat of Vaporization.** 130 Btu/lb
= 72 cal/g = 3.0 × 10⁵ J/kg

13 13 **Heat of Combustion:** -4 847.2 Btu/lb
= -2 692.9 cal/g = -112.67 × 10⁵ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

DEE — DICHLOROETHYL ETHER

Common Synonyms

Bis(2-chloroethyl) ether
2,2'-Dichloroethyl ether
Dichloroether
Di-(2-chloroethyl) ether
Chlorex

Liquid | Colorless | Sweet pleasant odor

Sinks and mixes slowly with water

[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

[illegible]

Exposure

[illegible]
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eye

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Bis(2-chloroethyl) ether, 2,2'-Dichloroethyl ether, Dichlorodiethyl ether, Di-(2-chloroethyl) ether, Chlorex, DCEE, beta, beta'-Dichloroethyl ether
3 2 **Coast Guard Compatibility Classification** Halogenated hydrocarbon
3 3 **Chemical Formula:** $(ClCH_2CH_2)_2O$
3 4 **IMCO/United Nations Numerical Designation:** 33 1916

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color.** Colorless
4 3 **Odor:** Sweet like chloroform

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves, protective clothing
5 2 **Symptoms Following Exposure:** Inhalation of vapor causes irritation of nose, coughing, nausea. Liquid irritates eyes and causes mild irritation of skin. (Can be absorbed in toxic amounts through the skin.) Ingestion causes irritation of mouth and stomach, symptoms of systemic poisoning
5 3 **Treatment for Exposure:** INHALATION: remove from exposure, support respiration, call physician if needed. EYES: irrigate with copious quantities of water for 15 min., call physician. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting, get medical attention
5 4 **Toxicity by Inhalation (Threshold Limit Value).** 5 ppm
5 5 **Short-Term Inhalation Limits.** 35 ppm for 30 min.
5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 75 mg/kg (rats)
5 7 **Late Toxicity:** Said to be carcinogenic
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations
5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 180°F (O.C.) 131°F (C.C.)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Water fog, foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** May form phosgene or hydrogen chloride in fires
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 696°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 2.4 mm./min.

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Nisso Petrochemical Industries Co., Ltd., Tokyo, Japan
2 Aldrich Chemical Co., Inc., 940 West St. Paul Avenue, Milwaukee, Wis. 53233
3 Eastman Kodak Co., Eastman Organic Chemicals, Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

APQXY

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 143.0
13 3 **Boiling Point at 1 atm:** 353°F = 178°C = 451°K
13 4 **Freezing Point.** −67°F = −55°C = 221°K
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.22 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 37.9 dynes/cm = 0.0379 N/m at 19°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** 4.93
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.0743
13 12 **Latent Heat of Vaporization:** 133 Btu/lb = 79 Kcal/g = 3.3 × 10⁵ J/kg
13 13 **Heat of Combustion:** (est.) −7,530 Btu/lb = −4.1 Ocal/g = −17.5 × 10⁵ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

DCM — DICHLOROMETHANE

Common Synonyms
Methylene chloride
Methylene dichloride

Watery liquid | Colorless | Sweet pleasant odor

Sinks in water. Irritating vapor is produced

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea and dizziness

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Methylene chloride
Methylene dichloride

3 2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3 3 **Chemical Formula:** CH_2Cl_2

3 4 **IMCO United Nations Numerical Designation:** 9 0 1593

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pleasant aromatic, like chloroform, sweet, ethereal

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor canister mask, safety glasses, protective clothing

5 2 **Symptoms Following Exposure** INHALATION: anesthetic effect, nausea and drunkenness. CONTACT WITH SKIN AND EYES: skin irritation, irritation of eyes and nose

5 3 **Treatment for Exposure.** INHALATION: remove to fresh air, oxygen if needed. INGESTION: induce vomiting. CONTACT WITH SKIN AND EYES: wash skin with soap and water, flush eyes with water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 500 ppm

5 5 **Short-Term Inhalation Limits** 1000 ppm for 30 min

5 6 **Toxicity by Ingestion** Grade 2; LD_{50} 0.5 to 5 g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor causes mask to irritate nose, but person will find high concentrations unpleasant. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If prolonged contact is allowed, it may cause smarting and reddening of the skin.

5 10 **Odor Threshold** 95 307 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable under conditions likely to be encountered

6 2 **Flammable Limits in Air:** 12 19%

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products:** Dissociation products generated in a fire may be irritating or toxic

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 1184°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Not pertinent

8 2 **Waterfowl Toxicity:** Not pertinent

8 3 **Biological Oxygen Demand (BOD)** Not pertinent

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Ansco Chemical Corp
Westlake, La 70669

2 Dow Chemical Co
Midland, Mich 48640

3 [illegible] Corp
Industrial Chemicals Division
451 Florida St
Baton Rouge, La 70801

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Various grade technical grade

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Inerted

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-2)

A P X

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** ORM A

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** 84.93

13 3 **Boiling Point at 1 atm:** 104°F = 39.8°C = 313.0 K

13 4 **Freezing Point** −142°F = −97.0°C = 176.2 K

13 5 **Critical Temperature:** 473°F = 245°C = 518 K

13 6 **Critical Pressure** 905 psia = 60.9 atm = 6.17 MN/m²

13 7 **Specific Gravity:** 1.322 at 20°C (liquid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 2.9

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.20

13 12 **Latent Heat of Vaporization.** 142 Btu/lb = 79.7 cal/g = 3.30 × 10⁵ J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(Continued on next card)

NOTES

REVISED 1978

DCP	2,4-DICHLOROPHENOL

Common Synonyms	Solid crystals — Colorless — Medicinal odor Sinks in water
	Avoid contact with solid and dust. Keep people away. Wear goggles, self-contained breathing apparatus and rubber protective clothing including gloves. Fire department Isolate and remove discharged material. Notify local health and pollution control agencies.
Fire	Combustible **POISONOUS GASES ARE PRODUCED IN FIRE** Wear goggles, self-contained breathing apparatus and rubber protective clothing including gloves. Extinguish with dry chemical, carbon dioxide, water spray or foam. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID **SOLID OR DUST** **Will burn skin and eyes** **Poisonous if swallowed** Remove contaminated clothing. Flush affected area with plenty of water. IF IN EYES: Hold eyelids open, flush with plenty of water. IF SWALLOWED: Induce vomiting. DO NOT induce vomiting if victim is unconscious or convulsing. Give large quantities of water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning. Warn boaters to maintain
Should be removed
Chemical and physical treatment

2. LABELS

Not hazardous as defined by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
None more synonymous

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:** $HOC_6H_3Cl_2$

3.4 **IMCO United Nations Numerical Designation** No. 2020

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color:** White

4.3 **Odor:** Strong, odorous

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber suit. Mask approved for organic vapors, chemical goggles

5.2 **Symptoms Following Exposure:** Tremors, convulsions, shortness of breath, irritation of respiratory system

5.3 **Treatment for Exposure:** Inhalation — rest. Ingestion — drink water, epsom salt solution

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 288°F (O.C.) 142°C

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Toxic gases are produced.

6.6 **Behavior in Fire:** Melts, boils and burns

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May react vigorously with oxidizing materials

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
5 ppm/3 hours/rainbow trout/killed/fresh water
5 ppm/12 hours/bluegills/killed/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** [illegible] 5 days

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 163.01

13.3 **Boiling Point at 1 atm:** 421°F = 216°C = 489 K

13.4 **Freezing Point:** 110°F = 43°C = 316°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.40 at 15°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

DCA — 2,4-DICHLOROPHENOXYACETIC ACID

Common Synonyms
2,4-D

Solid | White to tan | Odorless

Sinks in water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID
SOLID
POISONOUS IF SWALLOWED

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning; person-in-water
Contain spill
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard data required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2,4-D
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $C_8H_6Cl_2O_3$
3 4 **IMCO/United Nations Numerical Designation:** 6,1, 2609

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White to tan
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective dust mask, rubber gloves, chemical goggles
5 2 **Symptoms Following Exposure:** Dust may irritate eyes. Ingestion causes gastroenteric distress, diarrhea, mild central nervous system depression, dysphagia, and possible transient liver and kidney injury
5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: induce vomiting and follow with gastric lavage and supportive therapy
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3, oral rat LD_{50} = 375 mg/kg, rat; 50 mg/kg (human)
5 7 **Late Toxicity:** Causes birth defects in some laboratory animals
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water, foam
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen chloride or phosgene gases may form
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Upper 48 hr killifish/50% kill salt water 375 mg/l, 48 hr bluegill TL_m fresh water
8 2 **Waterfowl Toxicity:** LD_{50} = ~2000 mg/kg
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** No buildup in food chain

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640
2 Rhodia Inc
Chipman Division
120 Jersey Ave
New Brunswick, N J 08903
3 Monsanto Co
800 N Lindbergh Boulevard
St Louis, Mo 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM-A
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 221.0
13 3 **Boiling Point at 1 atm:** Very high
13 4 **Freezing Point:** 286°F = 141°C = 414°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.563 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** (est.) = -7,700 Btu/lb = -4,300 cal/g = -180 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DPP DICHLOROPROPANE

Common Synonyms
Propylene dichloride
1,2-dichloropropane

Watery liquid | Colorless | Sweet odor

Sinks in water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Issue warning: highly flammable.
Evacuate area.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
1,2-Dichloropropane
Propylene dichloride

3.2 **Coast Guard Compatibility Classification:**
Halogenated hydrocarbon

3.3 **Chemical Formula:** $CH_3CHClCH_2Cl$

3.4 **IMCO United Nations Numerical Designation:** 3.2/1279

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweet

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied or canister-type rubber gloves, chemical goggles, protective outer boots and rubber outerwear.

5.2 **Symptoms Following Exposure:** Contact with liquid causes skin irritation.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. CONTACT WITH SKIN OR EYES: wash with plenty of soap and water. If in eyes, wash with water continuously for 15 minutes. Get medical attention.

5.4 **Toxicity by Inhalation, Threshold Limit Value:** 75 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD_{50} 0.5-5 g/kg (guinea pig)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** A pungent vapor that may cause severe eye irritation, severe respiratory system irritation at high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Mild irritant to skin. Repeated or prolonged contact with liquid may cause skin damage and reddening of the skin.

5.10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point:** 60°F (CC), 70°F (OC)

6.2 **Flammable Limits in Air:**
3.4 - 14.5%

6.3 **Fire Extinguishing Agents:**
Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6.5 **Special Hazards of Combustion Products:**
Toxic and irritating gases may be generated.

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 1035°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Test 3.2 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
140 ppm/crustacea/TL_m/salt water

8.2 **Waterfowl Toxicity:**
Data not available

8.3 **Biological Oxygen Demand (BOD):**
Data not available

8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

Jefferson Chemical Co., Inc.
1121 Richmond Ave.
Houston, Texas 77002

Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Refined

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3.

X X X

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
Liquid

13.2 **Molecular Weight:** 112.9

13.3 **Boiling Point at 1 atm:**
206°F = 96.6°C = 369.8°K

13.4 **Freezing Point:**
-148°F = -100°C = 173°K

13.5 **Critical Temperature:** No pertinent

13.6 **Critical Pressure:** No pertinent

13.7 **Specific Gravity:** 1.159 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
37.9 dynes/cm = 0.0379 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** 3.9

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.094

13.12 **Latent Heat of Vaporization:**
122 Btu/lb = 2.7 x 10^5 J/kg

13.13 **Heat of Combustion:** -14,300 Btu/lb = -4100 cal/g = 17.0 x 10^3 J/kg

13.14 **Heat of Decomposition:** No pertinent

13.15 **Heat of Solution:** No pertinent

13.16 **Heat of Polymerization:** No pertinent

NOTES

REVISED 1978

DPR DICHLOROPROPENE

Common Synonyms
1,3-dichloropropene
Telone

Liquid | Colorless | Sweet odor

Sinks in water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Dispersed Flash

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
1,3-Dichloropropene
Telone

3.2 **Coast Guard Compatibility Classification**
Substituted allyl

3.3 **Chemical Formula:**
$C_3H_4Cl_2$

3.4 **IMCO United Nations Numerical Designation.** 1.2.208

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor.** Sweet, chloroform-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Avoid contact with liquid and vapor. In poorly ventilated areas, wear approved self-contained breathing apparatus. Rubber boots, gloves, and goggles should be worn.

5.2 **Symptoms Following Exposure:** Irritating to eyes, nose, and throat. Prolonged exposure to liquid may cause skin burns.

5.3 **Treatment for Exposure.** INHALATION: Remove patient to fresh air. Keep patient warm and at rest. Call physician immediately. Treat symptomatically. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Call physician immediately. Induce vomiting by means of syrup of ipecac followed by drinking large quantities of water. Never give anything by mouth to an unconscious person. Do not induce vomiting. CONTACT WITH SKIN OR EYES: Flush skin or eyes with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Grade 3. LD_{50} = 140 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation to eyes, nose, and throat. Prolonged exposure may cause pulmonary edema. Decontaminate personnel.

5.9 **Liquid or Solid Irritant Characteristics.** Can cause severe burns on contact. Prolonged or repeated exposure to skin may cause dermatitis. Wash exposed skin with soap and water.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 95 F C.C.

6.2 **Flammable Limits in Air:**
Data not available

6.3 **Fire Extinguishing Agents.** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6.5 **Special Hazards of Combustion Products:**
Toxic and irritating gases may be generated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Test: 3.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data for *Daphnia* toxicity and marine organisms
*Time period not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).**
Data not available

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Michigan

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Technical grade (97%)
Experimental grades of other purities

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Nitrogen blanket

10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A-V-Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 110.98

13.3 **Boiling Point at 1 atm:**
170°F = 77°C = 350°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.21 at 20°C (liquid)

13.8 **Liquid Surface Tension.**
31.2 dynes/cm = 0.0312 N/m at 24°C

13.9 **Liquid-Water Interfacial Tension:**
23.8 dynes/cm = 0.0235 N/m at 24°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Data not available

13.12 **Latent Heat of Vaporization:** (est.)
113 Btu/lb = 62.8 cal/g = 2.63 × 10^5 J/kg

13.13 **Heat of Combustion:** (est.) −16,900 Btu/lb
= −9396 cal/g = −1.60 × 10^7 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page two

NOTES

REVISED 1978

DTM — 4,4'-DICHLORO-alpha-TRICHLOROMETHYLBENZHYDROL

Common Synonyms
Dicofol
Kelthane
Kelthane
1,1-bis(p-chlorophenyl)
2,2,2-trichloroethanol

Solid (powder or liquid (solution))

Solid is white to grey liquid is brown

Solid is odorless liquid has odor of solvent

May float or sink in water

Fire

LIQUID SOLVENT MAY BE FLAMMABLE
SOLID IS COMBUSTIBLE
Irritating gases may be produced when heated
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

DUST
Irritating to eyes nose and throat
If inhaled will cause headache or dizziness

LIQUID OR SOLID
Irritating to skin and eyes
If swallowed will cause headache nausea or dizziness

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate warning water contaminated
Stop flow if it is safe to do so
Mechanical containment (liquid only)
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,1-Bis(p-chlorophenyl)-2,2,2-trichloroethanol; Dicofol; p,p'-dichlorobenzilic trichloromethylcarbinol; Dicofol; Kelthane; Kelthane; Kelthanethanol

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $ClC_6H_4C(OH)CCl_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Powder semi-solid or liquid

4.2 **Color:** White to gray solid red to black semi-solid brown liquid

4.3 **Odor:** Solids have slight characteristic odor liquid has odor of the solvent xylene

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus if exposed to vapor rubber gloves splash goggles

5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes nausea headache weakness convulsions possible kidney and liver damage Contact with eyes causes irritation

5.3 **Treatment for Exposure:** INHALATION move to fresh air apply artificial respiration and oxygen if indicated EYES wash for 15 min with water call a physician SKIN wash well with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 575 mg/kg rats 1,810 mg/kg oral rats

5.7 **Late Toxicity:** Suppresses immune reactions in rats

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 78.1°C (xylene)

6.2 **Flammable Limits in Air:** [illegible] (for xylene solutions)

6.3 **Fire Extinguishing Agents:** Foam dry chemical carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire

6.6 **Behavior in Fire:** Xylene solvent vapors may travel to source of ignition and flash back

6.7 **Ignition Temperature:** 464°C (for xylene solutions)

6.8 **Electrical Hazard:** Class I Group D

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Contact with steel at elevated temperature causes formation of toxic chlorine and hydrogen chloride gases Liquid may attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] copper 24-hr [illegible] for Bluegill in fresh water

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

Rohm and Haas Co
Independence Mall West
Philadelphia, PA [illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 92 - 96% 35% plus 65% inert solids 50% solution in xylene a combustible solvent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester (for liquid forms)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

Liquid S-T-E

Solid H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid

13.2 **Molecular Weight:** 370.5

13.3 **Boiling Point at 1 atm:** (Data applies to xylene solution solid decomposes) 282°F = 139°C = 412 K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** >1.1 at 20°C (solids) <0.9 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(continued on page 1-DTM)

NOTES

DPT

DICYCLOPENTADIENE

Common Synonyms
Dcpd

Liquid or solid crystals Colorless Camphor odor

Floats on water. Freezing point is 41°F

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

LIQUID OR SOLID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Dcpd
Tricyclo[5.2.1.0^{2,6}]deca-3,8-diene
4,7-Methanoindene

3.2 **Coast Guard Compatibility Classification:**
Group 1

3.3 **Chemical Formula:** $C_{10}H_{12}$

3.4 **IMCO United Nations Numerical Designation:** 1.1 2048

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Camphor-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear suitable protective clothing and gloves to prevent skin contact. Wear eye protection and face shield.

5.2 **Symptoms Following Exposure:** Vapor causes irritation to eyes, nose and throat. Can cause headache and dizziness. Direct contact with eyes causes severe irritation and reddening.

5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air. If not breathing, clear airway and start artificial respiration. If breathing is difficult, trained personnel should give oxygen. Get medical attention. EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 0.82 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation of eyes, nose and throat. Direct contact with eyes causes severe irritation and reddening.

5.9 **Liquid or Solid Irritant Characteristics:** Moderate irritation of eyes and skin. Direct contact with eyes causes severe irritation and reddening of the eyes.

5.10 **Odor Threshold:** 0.001 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 90°F (32°C)

6.2 **Flammable Limits in Air:**
1.1% to 6.5%

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical and water spray

6.4 **Fire Extinguishing Agents Not to be Used:** Not specified

6.5 **Special Hazards of Combustion Products:** Not specified

6.6 **Behavior in Fire:** Not specified

6.7 **Ignition Temperature:** 937°F (503°C)

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** May polymerize if heated above 150°F (66°C)

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Exxon Chemical Co.
Houston, Texas

National Petrochemicals Inc.
Tampa, Florida

Neville Chemical Co.
Pittsburgh, Pennsylvania

Velsicol Chemical Corp.
Chicago, Illinois

Reichhold Chemicals, Inc.
White Plains, New York

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 97%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open or vent for pressure relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

1.1 1

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
I	
Health	
Vapor Exposure	
Liquid and Solid Exposure	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Waterfowl Toxicity	
Physical	
Explosion Hazard	
Flammability	
Reactivity	

12.3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 132

13.3 **Boiling Point at 1 atm:**
347°F = 175°C = 448°K

13.4 **Freezing Point:** 41°F = 5°C = 278°K

13.5 **Critical Temperature:** Not available

13.6 **Critical Pressure:** Not available

13.7 **Specific Gravity:** 0.979 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
Data not available

13.9 **Liquid-Water Interfacial Tension:**
Data not available

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization:**
Not pertinent

13.13 **Heat of Combustion:** 18,430 BTU/lb = 10,400 cal/g = 435 × 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

NOTES

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DED DIELDRIN

Common Synonyms HEOD endo,exo-1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene	Solid	Light brown Mild chemical odor Sinks in water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause headache, dizziness, or loss of consciousness

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
If swallowed will cause headache, nausea, dizziness, vomiting, or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** HEOD endo,exo-1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{12}H_8Cl_6O$

3.4 **IMCO/United Nations Numerical Designation:** Not assigned

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Buff to light brown

4.3 **Odor:** Mild chemical

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** U.S. Bu. M. approved respirator, clean rubber gloves, goggles, face shield

5.2 **Symptoms Following Exposure:** Inhalation, ingestion, or skin contact causes irritation to membranes and severe nausea, vomiting, headache, staggering, tremors. Contact with eyes causes severe pain.

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air, give oxygen and artificial respiration as required. INGESTION: induce vomiting and get medical attention. EYES: flush with plenty of water, get medical attention. SKIN: flush with plenty of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.25 mg/m³

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** Grade 4; oral LD_{50} - 46 mg/kg (rats); 38 mg/kg (mice)

5.7 **Late Toxicity:** Banned by EPA in October 1974 because of suspected carcinogenic hazard to human health as a potential cancer agent in man

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and left to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** [illegible] ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen chloride fumes may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.025 mg/l (48 hr) threshold (fish) in fresh water; 0.1 ppm (48 hr) threshold (fish) in salt water; 0.020 ppm (96 hr) threshold (shrimp) in salt water; 0.025 - 0.90 ppm (48 hr) LC50 (shrimp) in salt water

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** High

9. SELECTED MANUFACTURERS

Shell Chemical Co.
Agricultural Div.
2401 Crow Canyon Rd.
San Ramon, Calif. 94583

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 85%; HEOD 18% emulsifiable concentrate in petroleum hydrocarbons which are combustible

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester (for liquid forms)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** ORM-A

*12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

*12.3 **NFPA Hazard Classification:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Solid

*13.2 **Molecular Weight:** 380.91

*13.3 **Boiling Point at 1 atm:** Not pertinent; decomposes

*13.4 **Freezing Point:** 349°F (176°C - 449 K)

*13.5 **Critical Temperature:** Not pertinent

*13.6 **Critical Pressure:** Not pertinent

*13.7 **Specific Gravity:** 1.75 at 20°C (water)

*13.8 **Liquid Surface Tension:** Not pertinent

*13.9 **Liquid-Water Interfacial Tension:** Not pertinent

*13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

*13.12 **Latent Heat of Vaporization:** Not pertinent

*13.13 **Heat of Combustion:** Data not available

*13.14 **Heat of Decomposition:** Not pertinent

*13.15 **Heat of Solution:** Not pertinent

*13.16 **Heat of Polymerization:** Not pertinent

continued on page 7 and 8

NOTES

DEA — DIETHANOLAMINE

Common Synonyms	Only liquid or solid crystals	Liquid is colorless Solid is white	Slight dead fish or ammonia odor
2,2'-Iminodiethanol Bis (2-hydroxyethyl) amine	Sinks and mixes with water		

Fire	**Combustible**
Exposure	**LIQUID** Irritating to skin and eyes
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Bis(2-hydroxyethyl) amine; DEA; 2,2'-Dihydroxydiethylamine; Diethanolamine; 2,2'-Iminodiethanol

3 2 **Coast Guard Compatibility Classification** Miscellaneous

3 3 **Chemical Formula** $(HOCH_2CH_2)_2NH$

3 4 **IMCO, United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild ammoniacal. Unobjectionable characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Full face mask ammonia-vapor mask only if required. Clean body-cover clothing; chemical goggles

5 2 **Symptoms Following Exposure** Irritation of eyes and skin. Breathing vapors may cause coughing, smothering sensation, nausea, headache

5 3 **Treatment for Exposure** INHALATION: no problem likely. Get medical attention if effects develop. INGESTION: induce vomiting if large amounts are swallowed; medical attention. Treat symptomatically. Not known to be toxic. EYES: flush with plenty of water for at least 15 min and get medical attention promptly. SKIN: flush with plenty of water. Wash contaminated clothing before reuse

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2. LD$_{50}$ 0.5 to 5 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapor causes moderate irritation such that personnel will avoid high concentrations unpleasant. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure

5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** 405 F OC

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents** Water, alcohol foam, carbon dioxide, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used** Addition of water may cause frothing

6 5 **Special Hazards of Combustion Products** Irritating vapors are generated when heated

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** 662 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** 0.74 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Flush with water

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** 2100 ppm/24 hr/sunfish/bluegill/TL$_m$/fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** 10 theo/5 days

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Jefferson Chemical Co. Inc.
333 Richmond Ave.
Houston, Texas 77002

2 Olin Corp.
Chemicals Division
120 Long Ridge Rd.
Stamford, Conn. 06904

3 Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity** 85, 99%

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook G 446-3

APQ

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight** 105.14

13 3 **Boiling Point at 1 atm** 505.1 F = 263.4 C = 541.6 K

13 4 **Freezing Point.** 82.4 F = 28 C = 301 K

13 5 **Critical Temperature** 824.1 F = 442 C = 715 K

13 6 **Critical Pressure** 470 psia = 32 atm = 3.2 MN/m^2

13 7 **Specific Gravity** 1.093 at 28 C (liquid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 0.83

13 12 **Latent Heat of Vaporization.** 276.30 Btu/lb = 148 cal/g = 6.20 × 10^5 J/kg

13 13 **Heat of Combustion** -10,790 Btu/lb = -6000 cal/g = -251 × 10^5 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** 100 g + 13 Btu/lb = 7 cal = -0.3 × 10^5 J/kg

13 16 **Heat of Polymerization** Not pertinent

Standard reference data

NOTES

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DEN	# DIETHYLAMINE

Common Synonyms			
DEN	Watery liquid	Colorless	Fishy, ammonia odor
	Floats and mixes with water	Flammable, irritating vapor is produced	

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Irritating vapors are produced when heated
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes nose and throat
Harmful if inhaled
[illegible]

LIQUID
Will burn eyes
Harmful if swallowed
[illegible]

Water Pollution

Harmful to aquatic life in very low concentrations
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning high flammability
Evacuate area
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** DEA
3 2 **Coast Guard Compatibility Classification** Aliphatic amine
3 3 **Chemical Formula** $(C_2H_5)_2NH$
3 4 **IMCO/United Nations Numerical Designation** 3 1154

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor** Ammoniacal sharp fishy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Chemical safety goggles rubber gloves and apron
5 2 **Symptoms Following Exposure** Irritation and burning of eyes skin and respiratory system High concentration of vapor can cause asphyxiation
5 3 **Treatment for Exposure:** In case of eye contact flush skin or eyes with plenty of water for at least 15 min for eyes get medical attention
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 25 ppm
5 5 **Short-Term Inhalation Limits** 100 ppm for 30 min
5 6 **Toxicity by Ingestion** Grade 2 0 5 to 5 g/kg rats
5 7 **Late Toxicity** None
5 8 **Vapor (Gas) Irritant Characteristics** Vapor or mist is extremely irritating but will not cause serious corneal damage at high vapor concentrations
5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard if prolonged contact with clothing and allowed to remain next to skin causing reddening of the skin
5 10 **Odor Threshold** 0 14 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 5°F O C
6 2 **Flammable Limits in Air.** [illegible]
6 3 **Fire Extinguishing Agents** Dry chemical carbon dioxide or alcohol foam
6 4 **Fire Extinguishing Agents Not to be Used** Data not available
6 5 **Special Hazards of Combustion Products** Vapors are irritating
6 6 **Behavior in Fire** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back
6 7 **Ignition Temperature.** 594°F
6 8 **Electrical Hazard** Data not available
6 9 **Burning Rate** [illegible] mm min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No hazardous reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** 85 mg/l/48 hr creek chub/TL$_m$ fresh water
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Air Products and Chemicals Inc Allentown Pa 18105
2 E I duPont de Nemours & Co Inc Industrial and Biochemicals Dept Wilmington Del 19898
3 Pennwalt Corp Chemical Division 4688 Biddle Ave Wyandotte Mich 48193

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99%
10 2 **Storage Temperature.** Data not available
10 3 **Inert Atmosphere** Data not available
10 4 **Venting** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q R S

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight:** 73 14
13 3 **Boiling Point at 1 atm:** 132°F = 55 9°C = 329 °K
13 4 **Freezing Point:** −57 6°F = −49 8°C = 223 4 °K
13 5 **Critical Temperature:** 434 3°F = 223 5 °C = 496 °K
13 6 **Critical Pressure:** 530 psia = 36 6 atm = 3 71 MN/m
13 7 **Specific Gravity:** 0 708 at 20 °C (liquid)
13 8 **Liquid Surface Tension:** 29 08 dynes/cm = 0 02908 N/m at 20 °C
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 2 5
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 079
13 12 **Latent Heat of Vaporization** 170 Btu/lb = 93 cal/g = 3 9 × 10^5 J/kg
13 13 **Heat of Combustion** −17 980 Btu/lb = −9994 cal/g = −418 4 × 10^5 J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution** −202 Btu/lb = −112 cal/g = −69 8 × 10^5 J/kg
13 16 **Heat of Polymerization** Not pertinent

Continued on page Vand A

NOTES

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DEB — DIETHYLBENZENE

Common Synonyms	
	Liquid Colorless Sweet, gasoline-like odor Floats on water
	[illegible]
Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon
3 3 **Chemical Formula:** $C_6H_4(C_2H_5)_2$
3 4 **IMCO/United Nations Numerical Designation:** 3 3/2049

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Characteristic aromatic like benzene like toluene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus safety goggles
5 2 **Symptoms Following Exposure:** High vapor concentrations produce eye and respirators tract irritation dizziness depression Liquid irritates and may blister skin can cause corneal injury to eye
5 3 **Treatment for Exposure** INHALATION remove to fresh air and start artificial respiration INGESTION do NOT induce vomiting call a doctor CONTACT WITH EYES AND SKIN flush with water for 15 min Wash skin with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 2 oral rat LD_{50} = 1 2 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 135°F C C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Foam water carbon dioxide or dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
3 7 **Ignition Temperature:** 743°F (ortho)
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 American Petrofina Inc
Cosden Oil & Chemical Co Division
Big Spring Texas 79720
2 Dow Chemical Co
Midland Mich 48640
3 Sinclair Koppers Co
Koppers bldg
Pittsburgh Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical (mixture of isomers)
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 134 21
13 3 **Boiling Point at 1 atm:** 356°F = 180°C = 453°K
13 4 **Freezing Point:** <160°F = <70°C = <343°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0 86 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 30 dynes/cm = 0 030 N m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** 140 Btu/lb = 77 cal/g = 3 2 × 10⁵ J/kg
13 13 **Heat of Combustion:** 17,800 Btu/lb = -9890 cal/g = -414 × 10⁵ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on p. [illegible]

NOTES

REVISED 1978

DEC

DIETHYL CARBONATE

Common Synonyms
Ethyl carbonate
Carbonic acid diethyl ester

Watery liquid | Colorless | Pleasant odor

Floats on water. Flammable irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPORS
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness, nausea, or loss of consciousness

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
Carbonic acid diethyl ester
ethyl carbonate
Fatin

3.2 **Coast Guard Compatibility Classification**
Ester

3.3 **Chemical Formula** $(C_2H_5O)_2CO$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pleasant ethereal mint and pineapple

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Protective clothing, rubber gloves and goggles. Organic vapor canister or air mask

5.2 **Symptoms Following Exposure.** High vapor concentrations can cause headache, irritation of eyes and respiratory tract, dizziness, nausea, weakness, loss of consciousness

5.3 **Treatment for Exposure:** INHALATION: Remove from exposure, administer artificial respiration and oxygen if needed. EYES: Flush with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion.** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors may cause slight irritation to eyes

5.9 **Liquid or Solid Irritant Characteristics:** Minimal irritation

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** [illegible]

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents.** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 3.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Too slow to be hazardous

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Chemetron Corp.
Organic Chemicals Division
[illegible]

2. FMC Corp.
Organic Chemicals Division
633 Third Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.0%

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NFU

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 118.13

13.3 **Boiling Point at 1 atm**
260.2°F = 126.8°C = 400.0°K

13.4 **Freezing Point**
-43°F = -43°C = 230°K

13.5 **Critical Temperature:** No data

13.6 **Critical Pressure:** No data

13.7 **Specific Gravity:** 0.975 at 20°C (liquid)

13.8 **Liquid Surface Tension**
26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
12 dynes/cm = 0.012 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity**
No pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
[illegible]

13.12 **Latent Heat of Vaporization**
[illegible]

13.13 **Heat of Combustion:** -9760 Btu/lb
= -5420 cal/g = -227 × 10⁵ J/kg

13.14 **Heat of Decomposition:** No pertinent

13.15 **Heat of Solution:** No pertinent

13.16 **Heat of Polymerization:** No pertinent

(continued next page)

NOTES

REVISED 1978

DEG — DIETHYLENE GLYCOL

Common Synonyms
DEG
2,2'-Oxybisethanol
Diglycol
2,2'-Dihydroxydiethyl ether

Oily liquid | Colorless | Odorless

Sinks and mixes with water

Fire

Combustible

Exposure

Not harmful

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-6

Dissolve and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bis(2-hydroxyethyl) ether
Diglycol
β,β'-Dihydroxydiethyl ether
2-(2-Hydroxyethoxy)-ethanol
2,2'-oxybisethanol

3.2 **Coast Guard Compatibility Classification**
Glycol

3.3 **Chemical Formula**
$(HOCH_2CH_2)_2O$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Practically odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Full face mask with canister for short exposure to high vapor levels; rubber gloves; goggles

5.2 **Symptoms Following Exposure:** Ingestion of large amount may cause degeneration of kidneys and liver and may cause death. Liquid may cause slight skin irritation.

5.3 **Treatment for Exposure** INHALATION: no problem likely. If any ill effects develop, get medical attention. INGESTION: induce vomiting if ingested. No known antidote; treat symptoms. In EYE AND SKIN flush with water. If ill effects occur, get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm (recommended)

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 0 [Ibid., p. 1]

5.7 **Late Toxicity:** Kidney and liver damage

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** None

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** 255°F C.C.

6.2 **Flammable Limits in Air.**
1.6 - 10%

6.3 **Fire Extinguishing Agents** Alcohol foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature** 444°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** 1.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
> 42,000 ppm/96 hr/mosquitofish/TL$_m$/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 0.6 lb/lb, 5 days

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. Jefferson Chemical Co., Inc.
1121 Richmond Ave.
Houston, Texas 77052
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity.** Regular grade, polyester grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446

VPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 106.12

13.3 **Boiling Point at 1 atm**
472°F = 244°C = 517°K

13.4 **Freezing Point** 20°F = -7°C = 266°K

13.5 **Critical Temperature.**
716°F = 375°C = 648°K

13.6 **Critical Pressure**
[illegible] = 46.0 atm = 4.7 MN/m²

13.7 **Specific Gravity:** 1.118 at 20°C (liquid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization**
270 Btu/lb = 150 cal/g = 6.3 × 10⁵ J/kg

13.13 **Heat of Combustion** −9617 Btu/lb
= −5343 cal/g = −223.7 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

[illegible] Chemical Safety Data Sheet SD-[illegible]

NOTES

DGD — DIETHYLENE GLYCOL DIMETHYL ETHER

Common Synonyms
Poly Sol
Bis(2-methoxyethyl)-ether
Diglyme

Water: liquid | Color: less | Odor: pleasant odor

Floats and mixes with water

Stop discharge if possible

Fire

Combustible

Exposure

ACUTE/CHRONIC HAZARDS

LIQUID
If swallowed will cause nausea, vomiting or loss of consciousness
IF SWALLOWED [illegible] UNCONSCIOUS [illegible] drink water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
Bis(2-methoxyethyl)-ether
Diglyme
Poly Sol

3.2 **Coast Guard Compatibility Classification**
Alcohol, glycol, glycol ether

3.3 **Chemical Formula**
$(CH_3OCH_2CH_2)_2O$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild/ethereal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Vinyl [illegible] rubber [illegible] face shield, goggles

5.2 **Symptoms Following Exposure.** INGESTION causes nausea, vomiting, abdominal cramps, weakness, progressing to coma

5.3 **Treatment for Exposure.** INGESTION: induce vomiting [illegible] and induce artificial respiration if breathing stops, as needed

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion.** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** None

5.9 **Liquid or Solid Irritant Characteristics** None

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 138 F OC

6.2 **Flammable Limits in Air**
Data not available

6.3 **Fire Extinguishing Agents.**
Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products.**
Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:**
Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available

8.2 **Waterfowl Toxicity**
Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. Olin Corp
Chemicals Division
120 Long Ridge Rd
Stamford, Conn. 06904

Pfanstiehl Co
Chemical Division
1219 Glenn St
Marinette, Wis. 54143

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Technical

10.2 **Storage Temperature:**
Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3)

VPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** 134.12

13.3 **Boiling Point at 1 atm:**
324°F = 162°C = 435°K

13.4 **Freezing Point**
−94°F = −70°C = 203°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.948 at 20°C (liquid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization**
130 Btu/lb = 72 cal/g = 3.01 × 10⁵ J/kg

13.13 **Heat of Combustion:** [illegible] −11,800 Btu/lb
= −6,240 cal/g = −26.2 × 10⁶ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

DME — DIETHYLENEGLYCOL MONOBUTYL ETHER

Common Synonyms

242 Butoxyethoxyethanol
Butoxydiethylene glycol
Butyl "Carbitol"
Dowanol DB
Poly-Sols DB

Liquid | Colorless | Mild pleasant odor

Mixes with water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Butoxydiethylene glycol, Butoxydiglycol, Diglycol monobutyl ether, Butyl "Carbitol", Dowanol DB, Poly-Sols DB

3 2 **Coast Guard Compatibility Classification:** Glycol ether

3 3 **Chemical Formula:** $C_4H_9OCH_2CH_2OCH_2CH_2OH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild characteristic pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation for brief periods has no significant effect. Contact with liquid causes moderate irritation of eyes and corneal injury. Prolonged contact with skin causes only minor irritation.

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air; if ill effects are observed, call a doctor. EYES: immediately flush with plenty of water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give large amounts of water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 2 g/kg (guinea pig)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 240 F (OC) 272 F (CC)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, alcohol foam, carbon dioxide, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 442°F

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** 3.3 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
44% of theoretical in 5 days

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Shell Chemical Company
Industrial Chemicals Division
One Shell Plaza
Houston, Texas 77001

3. Jefferson Chemical Company, Inc.
260 Madison Avenue
New York, N.Y. 10016

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	1
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 162.2

*13 3 **Boiling Point at 1 atm:**
428 F = 220 C = 493 K

13 4 **Freezing Point:** -40 F = -40 C = 233 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.955 at 20 C (liquid)

13 8 **Liquid Surface Tension:**
34 dynes/cm = 0.034 N/m at 25 C

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization.** 100 Btu/lb
= 74 cal/g = 3.1 X 10^5 J/kg

13 13 **Heat of Combustion:** (est.) -4000 Btu/lb
= -7500 cal/g = -31 X 10^6 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** (est.) -95 Btu/lb
= -20 cal/g = -0.84 X 10^5 J/kg

*13 16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

CEM

DIETHYLENEGLYCOL MONOBUTYL ETHER ACETATE

Common Synonyms
2-(2-Butoxyethoxy) ethanol acetate
2-(2-Butoxyethoxy) ethyl acetate
Diglycol monobutyl ether acetate
Butyl "Carbitol" acetate

Liquid | Colorless | Mild odor

Floats and mixes slowly with water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning - water contaminant
Dispense and flush

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-(2-Butoxyethoxy)ethyl acetate; Diglycol monobutyl ether acetate; Butyl Carbitol acetate; Ektasolve DB Acetate

3.2 **Coast Guard Compatibility Classification.** Ester (13)

3.3 **Chemical Formula:** $CH_3CO_2CH_2CH_2OCH_2CH_2OC_4H_9$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild - unresidual

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Face shield or safety glasses; protective gloves; a mask for prolonged exposure to vapor

5.2 **Symptoms Following Exposure:** Prolonged breathing of vapor may cause irritation and nausea. Contact with liquid may cause moderate irritation of eyes and skin. Can be absorbed through skin in toxic amounts.

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air. If breathing has stopped, administer artificial respiration. EYES: flush with water for at least 15 min. SKIN: wash skin with large amounts of water for 15 min; call physician if needed. INGESTION: induce vomiting; get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Because of high boiling point (245 °C) hazards from inhalation are minimal

5.6 **Toxicity by Ingestion.** Grade 2; oral LD_{50} = 2.34 g/kg (guinea pig)

5.7 **Late Toxicity:** Kidney damage noted in animals following repeated contact with skin

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 240 °F (116 °C)

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents.** Water, alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 361 °F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate.** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662

3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 98+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

XPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm** Liquid

*13.2 **Molecular Weight:** 204.3

*13.3 **Boiling Point at 1 atm:** 475 °F = 246 °C = 519 K

*13.4 **Freezing Point:** [illegible] °F = [illegible] °C = 240 K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.955 at 20 °C (liquid)

13.8 **Liquid Surface Tension:** (est.) 22 dynes/cm = 0.022 N/m at 20 °C

13.9 **Liquid-Water Interfacial Tension** Not pertinent

*13.10 **Vapor (Gas) Specific Gravity** Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** [illegible] Btu/lb = [illegible] cal/g = 2.5 × 10^5 J/kg

13.13 **Heat of Combustion:** (est.) [illegible] Btu/lb = [illegible] cal/g = 11.0 × 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) 27 Btu/lb = 15 cal/g = 0.63 × 10^5 J/kg

*13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DGE — DIETHYLENE GLYCOL MONOETHYL ETHER

Common Synonyms
Poly Sols DE
Dressol DE
Carbitol
2-(2-ethoxyethoxy) ethanol

Liquid | Colorless | Fruity odor

Floats and mixes with water

Fire

Combustible

Exposure

LIQUID
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Dike and flush

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
P-Sols DE

3.2 Coast Guard Compatibility Classification

3.3 Chemical Formula:
$CH_3CH_2OCH_2CH_2OCH_2CH_2OH$

3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid

4.2 Color:

4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:

5.2 Symptoms Following Exposure:

5.3 Treatment for Exposure: SKIN AND EYES

5.4 Toxicity by Inhalation (Threshold Limit Value):

5.5 Short-Term Inhalation Limits:

5.6 Toxicity by Ingestion:

5.7 Late Toxicity:

5.8 Vapor (Gas) Irritant Characteristics:

5.9 Liquid or Solid Irritant Characteristics:

5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point: 201 F CC (93 C)

6.2 Flammable Limits in Air:

6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical or carbon dioxide

6.4 Fire Extinguishing Agents Not to be Used: Not pertinent

6.5 Special Hazards of Combustion Products: Not pertinent

6.6 Behavior in Fire: Not pertinent

6.7 Ignition Temperature: 420 F

6.8 Electrical Hazard: Not pertinent

6.9 Burning Rate: 2.5 mm/min

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: Not reactive

7.2 Reactivity with Common Materials: Not reactive

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): 84% (5 days, theor.)

8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

Jefferson Chemical Co. Inc.
1121 Richmond Ave.
Houston, Texas 77002

Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 Grades of Purity: Commercial

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: No requirement

10.4 Venting: Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

APQ

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
Not listed

12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating
Fire	1
Health	
Vapor Toxicity	0
Liquid or Solid Toxicity	0
Poisons	0
Water Pollution	
Harmful Quantities	1
Aquatic Toxicity	0
Accumulation	
Reactivity	
Other Chemicals	2
Water	0
Self-Reaction	0

12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid

13.2 Molecular Weight: 134.17

13.3 Boiling Point at 1 atm.
401 F = 205 C = 478 K

13.4 Freezing Point.
-105 F = -76 C = 197 K

13.5 Critical Temperature: Not pertinent

13.6 Critical Pressure: Not pertinent

13.7 Specific Gravity: 0.9932 @ 20/20 C (liquid)

13.8 Liquid Surface Tension: Not pertinent

13.9 Liquid-Water Interfacial Tension: Not pertinent

13.10 Vapor (Gas) Specific Gravity: Not pertinent

13.11 Ratio of Specific Heats of Vapor (Gas):
Not pertinent

13.12 Latent Heat of Vaporization.
Not pertinent = Not pertinent BTU/lb

13.13 Heat of Combustion: 11,390 Btu/lb
= -6330 cal/g = 265 × 10^3 J/kg

13.14 Heat of Decomposition: Not pertinent

13.15 Heat of Solution: Not pertinent

13.16 Heat of Polymerization: Not pertinent

(Continued on page 1-A)

NOTES

REVISED 1978

DGM — DIETHYLENE GLYCOL MONOMETHYL ETHER

Common Synonyms
Poly-Solv DM
Dowanol DM
2-(2-methoxyethoxy)-ethanol
Methyl Carbitol

Liquid | Colorless | Pleasant odor

Floats and mixes with water

Fire

Combustible

Exposure

LIQUID
Irritating to eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Dispersal and Flush

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Diethylene Glycol Monomethyl Ether
Dowanol DM
2-(2-Methoxyethoxy)-ethanol
Methyl Carbitol
Poly-Solv DM

3.2 Coast Guard Compatibility Classification: Group One

3.3 Chemical Formula: $C_5H_{12}O_3$ or $CH_3O(CH_2)_2O(CH_2)_2OH$

3.4 IMCO United Nations Numerical Designation: Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid

4.2 Color: Colorless

4.3 Odor: Mild ether-like characteristic

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Not specified

5.2 Symptoms Following Exposure: Liquid irritating to eyes

5.3 Treatment for Exposure: SKIN OR EYES: Flush with water

5.4 Toxicity by Inhalation (Threshold Limit Value): Not established

5.5 Short-Term Inhalation Limits: Not established

5.6 Toxicity by Ingestion: Oral LD50 (rat) 5.5 g/kg

5.7 Late Toxicity: Data not available

5.8 Vapor (Gas) Irritant Characteristics: None

5.9 Liquid or Solid Irritant Characteristics: Mild

5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 Flash Point: 201°F CC

6.2 Flammable Limits in Air: LEL – 1.8%

6.3 Fire Extinguishing Agents: Water, carbon dioxide, dry chemical

6.4 Fire Extinguishing Agents Not to be Used: Not pertinent

6.5 Special Hazards of Combustion Products: Not pertinent

6.6 Behavior in Fire: Not pertinent

6.7 Ignition Temperature: Data not available

6.8 Electrical Hazard: Not pertinent

6.9 Burning Rate: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction

7.2 Reactivity with Common Materials: No reaction

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): 34% of theoretical in 5 days

8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Eastman Kodak Co
Texas Eastman Division
Kingsport, Tennessee 37662

Jefferson Chemical
2000 Richard Ave
Houston, Texas 77002

Union Carbide Corp
Chemicals & Plastics Div
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 Grades or Purity: Commercial

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: Not required

10.4 Venting: Open or pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, 2nd edition

NPQ

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combustible Liquid

12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating
Fire	
Health	
Liquid Solid Gas	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Wildlife Effects	
Scale:	
0=No Chemical	
1=Slight	
2=Moderate	
3=Severe	

12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid

13.2 Molecular Weight: 120.15

13.3 Boiling Point at 1 atm: 388°F = 198°C = 471°K

13.4 Freezing Point: -70°F = -57°C = 216°K

13.5 Critical Temperature: Not available

13.6 Critical Pressure: Not available

13.7 Specific Gravity: 0.9595 at 20°C/4°C

13.8 Liquid Surface Tension: Not available

13.9 Liquid-Water Interfacial Tension: Not available

13.10 Vapor (Gas) Specific Gravity: Not available

13.11 Ratio of Specific Heats of Vapor (Gas): Not available

13.12 Latent Heat of Vaporization: 101 Btu/lb = 56.1 cal/g = 235 × 10^3 J/kg

13.13 Heat of Combustion: 10,830 Btu/lb = -6020 cal/g = -252 × 10^3 J/kg

13.14 Heat of Decomposition: Not available

13.15 Heat of Solution: Not available

13.16 Heat of Polymerization: Not available

NOTES

REVISED 1978

DET — DIETHYLENETRIAMINE

Common Synonyms
2,2' Diaminodiethylamine
Bis (2-aminoethyl) amine

Liquid | Colorless to yellow | Ammonia odor

Floats and mixes with water

Fire

Combustible

Exposure

LIQUID
Will burn skin and eyes.
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intake

1 RESPONSE TO DISCHARGE

Dispersal and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Bis 2 aminoethylamine
2,2' Diaminodiethylamine

3.2 **Coast Guard Compatibility Classification.**
Amine

3.3 **Chemical Formula.**
$NH_2CH_2CH_2NHCH_2CH_2NH_2$

3.4 **IMCO United Nations Numerical Designation:** Not assigned

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to light amber yellow

4.3 **Odor:** Strong ammoniacal to slightly ammoniacal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Amine respirators, safety goggles, rubber gloves, splash proof garments

5.2 **Symptoms Following Exposure:** Prolonged breathing of vapor may cause asthma. Liquid harmful to skin and eyes. Vapor irritating

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: Do NOT induce vomiting; give large quantities of water; give activated charcoal in suspension if available; call a physician immediately. SKIN CONTACT: flush with plenty of water. EYE CONTACT: flush with plenty of water for at least 15 minutes and get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 500 mg/kg rats

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns during exposure

5.10 **Odor Threshold:** 10 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 200°F (OC)

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water stream may cause frothing

6.5 **Special Hazards of Combustion Products.** Irritating vapors are generated when heated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No hazards in reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 710 ppm/24 hr/brine shrimp/TL_m

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** 23% of theoretical in 5 days/freshwater acclimated seed

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640

2. Jefferson Chemical Co. Inc.
1121 Richmond Ave.
Houston, Texas 77002

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

*10.1 **Grades or Purity:** 98.5%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

VPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Corrosive Material

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicants	2
Aquatic Toxicants	2
Aesthetic Effects	
Reactivity	
Other Chemicals	3
Water	0
Self Reactive	0

*12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 103.17

*13.3 **Boiling Point at 1 atm:** 405.4°F or 207.4°C or 480.6 K

13.4 **Freezing Point:** 11.4°F or -11.5°C or 261.8 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.9544 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

*13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** [illegible]

*13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4

NOTES

REVISED 1978

DEP — DI-(2-ETHYLHEXYL) PHOSPHORIC ACID

Common Synonyms
2-Ethyl-1-hexanol hydrogen phosphate
Bis(2-ethylhexyl) hydrogen phosphate
Di(2-ethylhexyl) phosphate
Di-(2-ethylhexyl) acid phosphate

Liquid | Light yellow | Odorless

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning - corrosive water contaminant
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bis-(2-ethylhexyl) hydrogen phosphate; D-(2-ethylhexyl) phosphate; D-(2-ethylhexyl) acid phosphate; DEHPA

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $[CH_3(CH_2)_3CH(C_2H_5)CH_2O]_2POOH$

3.4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Amber

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves; protective clothing

5.2 **Symptoms Following Exposure:** Contact with liquid or concentrated mist may cause severe skin burns; consult an eye specialist. Mist causes skin irritation or burns. Ingestion produces irritation or burns followed by strong thirst.

5.3 **Treatment for Exposure:** EYES: immediately flush with plenty of water for at least 15 min; get medical attention. SKIN: immediately flush with plenty of water for at least 15 min. INGESTION: induce vomiting and call physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 (oral) 2 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to the eyes and throat.

5.9 **Liquid or Solid Irritant Characteristics:** Causes severe burning. Moderate pain and first degree burns in short exposure and may cause second degree burns on prolonged exposure.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 385 F (OC)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Irritating phosphorus oxides may be released

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Mildly corrosive to most metals; may form flammable hydrogen gas

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, NY 10017

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 92+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

NFI

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	3
Poisons	1
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 322.4

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:** $-7°C < T_f < -10°C$ or $266°K < T_f < 263°K$

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.97 at 20 C (liquid)

13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20 C

13.9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20 C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** -13,500 Btu/lb (-7.5 x 10^6 J/kg)

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DPH — DIETHYL PHTHALATE

Common Synonyms:
Phthalic acid diethyl ester
Ethyl phthalate
1,2-Benzenedicarboxylic acid diethyl ester

Liquid | White | Mild chemical odor

Sinks in water
Freezing point is 2°F

Fire

Combustible
Irritating fumes may be produced when heated

Exposure

LIQUID
Not harmful

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by DOT
Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2-Benzenedicarboxylic acid diethyl ester; Ethyl phthalate; Phthalic acid diethyl ester
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $C_{12}H_{14}O_4$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Slight characteristic ester odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles or faceshield
5.2 **Symptoms Following Exposure:** Not expected to be a health hazard
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: flush with water. SKIN: wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1; Rat LD50: 8600 mg/kg
5.7 **Late Toxicity:** Prolonged inhalation of high concentrations may cause irritation of upper respiratory tract and damage
5.8 **Vapor (Gas) Irritant Characteristics:** Unknown
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 320°F C.O.C.
6.2 **Flammable Limits in Air:** 1.1 to 9.5% by volume
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products:** Irritating vapors of unburned chemical may form on fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** 850°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May attack some forms of plastics
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 1.2 ppm 96-min goldfish killed fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Eastman Chemical Products Inc, Kingsport, Tenn. 37662
2. Monsanto Company, 800 North Lindbergh Blvd, St. Louis, Mo. 63166
3. Aldrich Chemical Co, 940 W. Saint Paul Ave, Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical, 99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NAS

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
*12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid
*13.2 **Molecular Weight:** 222
*13.3 **Boiling Point at 1 atm:** 569°F = 298°C = 571°K
*13.4 **Freezing Point:** 2°F = -3°C = 270 K
*13.5 **Critical Temperature:** Not pertinent
*13.6 **Critical Pressure:** Not pertinent
*13.7 **Specific Gravity:** 1.12 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 37.5 dynes/cm = 0.0375 N/m at 20°C
*13.9 **Liquid-Water Interfacial Tension:** 27 dynes/cm = 0.0162 N/m at 20°C
*13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 0.1 Btu/lb = 0.1 cal/g = 0.1 kcal/kg
*13.13 **Heat of Combustion:** -10,900 Btu/lb = -6,060 cal/g = -6.06 kcal/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(continued on next sheet)

NOTES

DEZ — DIETHYLZINC

Common Synonyms

Zinc diethyl
Ethylzinc
Zinc ethyl

Watery liquid Colorless

IGNITES WHEN EXPOSED TO AIR. Flammable irritating vapor is produced.

Fire

IGNITES WHEN EXPOSED TO AIR

Exposure

VAPOR OR DUST
Irritating to eyes, nose and throat.
If inhaled will cause headache or difficult breathing.

LIQUID
Will burn skin and eyes.
If swallowed will cause nausea and vomiting.

Water Pollution

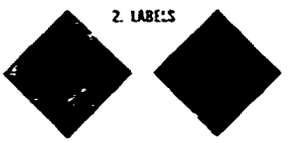
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Initial Isolation: 100 feet (30 meters)
Restrict Access
Evacuate Area

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Zinc diethyl; Ethylzinc; Zinc ethyl
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $(C_2H_5)_2Zn$
3.4 **IMCO/United Nations Numerical Designation:** 4.06

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Not pertinent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Cartridge type or fresh air mask for fumes or vapor. PVC fire retardant or asbestos gloves, full face shield, safety glasses or goggles, fire retardant coveralls as standard wear for special cases use asbestos suit or fire suit.

5.2 **Symptoms Following Exposure:** Inhalation: Irritation of the gastrointestinal tract, irritation of the eyes, nose and throat, coughing, difficult breathing, headache, nausea, vomiting, abdominal pain, diarrhea, weakness, dizziness, and loss of consciousness. Prolonged inhalation of high concentrations may cause death. Skin: Causes severe burns. Eyes: Causes severe burns. Ingestion: Causes severe burns of the mouth, throat, and gastrointestinal tract. Fire: Flammable. Explosion: Flammable vapor may form explosive mixtures with air. Explosion hazard indoors, outdoors or in sewers. Reactivity: Reacts violently with water, producing flammable ethane gas. Reacts violently with air, producing heat and flammable ethane gas. Reacts violently with oxidizers, halogens, and many other materials. Contact with moist air may cause ignition. Contact with water may cause ignition. Contact with acids may cause ignition. Contact with alcohols may cause ignition. Contact with halogens may cause ignition. Contact with oxidizers may cause ignition. Contact with many other materials may cause ignition. Contact with water may cause ignition. Contact with air may cause ignition. Contact with moisture may cause ignition. Contact with heat may cause ignition. Contact with sparks may cause ignition. Contact with flames may cause ignition. Contact with hot surfaces may cause ignition. Contact with friction may cause ignition. Contact with impact may cause ignition. Contact with static electricity may cause ignition. Contact with electrical equipment may cause ignition. Contact with lightning may cause ignition. Contact with radiation may cause ignition. Contact with ultraviolet light may cause ignition. Contact with infrared light may cause ignition. Contact with visible light may cause ignition. Contact with X-rays may cause ignition. Contact with gamma rays may cause ignition. Contact with neutrons may cause ignition. Contact with alpha particles may cause ignition. Contact with beta particles may cause ignition. Contact with cosmic rays may cause ignition. Contact with natural radioactivity may cause ignition. Contact with artificial radioactivity may cause ignition. Contact with nuclear radiation may cause ignition. Contact with ionizing radiation may cause ignition. Contact with non-ionizing radiation may cause ignition. Contact with electromagnetic radiation may cause ignition. Contact with thermal radiation may cause ignition. Contact with heat radiation may cause ignition. Contact with light radiation may cause ignition. Contact with sound radiation may cause ignition. Contact with mechanical radiation may cause ignition. Contact with kinetic radiation may cause ignition. Contact with potential radiation may cause ignition. Contact with chemical radiation may cause ignition. Contact with biological radiation may cause ignition. Contact with genetic radiation may cause ignition. Contact with psychological radiation may cause ignition. Contact with social radiation may cause ignition. Contact with economic radiation may cause ignition. Contact with political radiation may cause ignition. Contact with legal radiation may cause ignition. Contact with ethical radiation may cause ignition. Contact with moral radiation may cause ignition. Contact with religious radiation may cause ignition. Contact with philosophical radiation may cause ignition. Contact with aesthetic radiation may cause ignition. Contact with artistic radiation may cause ignition. Contact with literary radiation may cause ignition. Contact with musical radiation may cause ignition. Contact with theatrical radiation may cause ignition. Contact with cinematic radiation may cause ignition. Contact with photographic radiation may cause ignition. Contact with digital radiation may cause ignition. Contact with analog radiation may cause ignition. Contact with electronic radiation may cause ignition. Contact with optical radiation may cause ignition. Contact with magnetic radiation may cause ignition. Contact with gravitational radiation may cause ignition. Contact with quantum radiation may cause ignition. Contact with relativistic radiation may cause ignition. Contact with cosmological radiation may cause ignition. Contact with astrophysical radiation may cause ignition. Contact with geophysical radiation may cause ignition. Contact with meteorological radiation may cause ignition. Contact with climatological radiation may cause ignition. Contact with oceanographic radiation may cause ignition. Contact with hydrological radiation may cause ignition. Contact with glaciological radiation may cause ignition. Contact with volcanological radiation may cause ignition. Contact with seismological radiation may cause ignition. Contact with tectonic radiation may cause ignition. Contact with geological radiation may cause ignition. Contact with paleontological radiation may cause ignition. Contact with archaeological radiation may cause ignition. Contact with anthropological radiation may cause ignition. Contact with sociological radiation may cause ignition. Contact with psychological radiation may cause ignition. Contact with economic radiation may cause ignition. Contact with political radiation may cause ignition. Contact with legal radiation may cause ignition. Contact with ethical radiation may cause ignition. Contact with moral radiation may cause ignition. Contact with religious radiation may cause ignition. Contact with philosophical radiation may cause ignition. Contact with aesthetic radiation may cause ignition. Contact with artistic radiation may cause ignition. Contact with literary radiation may cause ignition. Contact with musical radiation may cause ignition. Contact with theatrical radiation may cause ignition. Contact with cinematic radiation may cause ignition. Contact with photographic radiation may cause ignition. Contact with digital radiation may cause ignition. Contact with analog radiation may cause ignition. Contact with electronic radiation may cause ignition. Contact with optical radiation may cause ignition. Contact with magnetic radiation may cause ignition. Contact with gravitational radiation may cause ignition. Contact with quantum radiation may cause ignition. Contact with relativistic radiation may cause ignition. Contact with cosmological radiation may cause ignition. Contact with astrophysical radiation may cause ignition. Contact with geophysical radiation may cause ignition. Contact with meteorological radiation may cause ignition. Contact with climatological radiation may cause ignition. Contact with oceanographic radiation may cause ignition. Contact with hydrological radiation may cause ignition. Contact with glaciological radiation may cause ignition. Contact with volcanological radiation may cause ignition. Contact with seismological radiation may cause ignition. Contact with tectonic radiation may cause ignition. Contact with geological radiation may cause ignition. Contact with paleontological radiation may cause ignition. Contact with archaeological radiation may cause ignition. Contact with anthropological radiation may cause ignition. Contact with sociological radiation may cause ignition.

5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air immediately. If not breathing, clear airway and begin artificial respiration. If breathing is difficult, oxygen should be given. Skin: Immediately remove and isolate contaminated clothing. Flush affected area with large amounts of water for at least 15 minutes. Wash gently and thoroughly with soap and water. Seek medical attention as soon as possible. Do not use chemical neutralizers. Eyes: Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Seek medical attention as soon as possible. Do not use chemical neutralizers. Ingestion: Do not induce vomiting. If victim is conscious and not convulsing, have victim drink large amounts of water or milk immediately. If vomiting occurs, give more fluids. Get medical attention.

(continued on page 4)

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (or less than ambient)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Dry chemical, sand or powdered graphite
6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam, halogenated agents, carbon dioxide
6.5 **Special Hazards of Combustion Products:** Highly toxic vapor is given off when burned. Can cause metal fume fever.
6.6 **Behavior in Fire:** Reacts spontaneously with air, water, and moisture with evolution of flammable ethane gas. Contact with water or approved quench agent recommended for fire.
6.7 **Ignition Temperature:** Below 0°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form flammable ethane gas
7.2 **Reactivity with Common Materials:** Will react with surface moisture generating flammable ethane gas
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Not pertinent
8.2 **Waterfowl Toxicity:** Not pertinent
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Ethyl Corporation
Industrial Chemicals Division
Ethyl Tower
451 Florida
Baton Rouge, La. 70801

Texas Alkyls, Incorporated
P.O. Box 400
Deer Park, Texas 77536

Newport Industries
Alkyl Products
P.O. Box 90
Bayport, Minnesota 55003

10 SHIPPING INFORMATION

*10.1 **Grades of Purity:** Technical grade as 25% by weight solution in high-boiling hydrocarbon solvent
10.2 **Storage Temperature:** Ambient
*10.3 **Inert Atmosphere:** Dry nitrogen or other inert gas
*10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NOZ

12 HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
*12 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid
*13.2 **Molecular Weight:** 123.5
*13.3 **Boiling Point at 1 atm:** 243°F (117°C)
13.4 **Freezing Point:** -71°F (-57°C)
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
*13.7 **Specific Gravity:** 1.207 at 20°C (liquid)
*13.8 **Liquid Surface Tension:** 20 dynes/cm = 0.020 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
*13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
*13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 0.0 Btu/lb = 0.0 cal/g = 0.0 J/kg
*13.13 **Heat of Combustion:** -8,400 Btu/lb = -4,700 cal/g = -19.7 x 10^3 J/kg
13.14 **Heat of Decomposition:** Not pertinent
*13.15 **Heat of Solution:** Not pertinent
*13.16 **Heat of Polymerization:** Not pertinent

(continued on page 3 and 4)

5 HEALTH HAZARDS (Cont'd)

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** Not pertinent
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

DFE — 1,1-DIFLUOROETHANE

Common Synonyms
Ethylidene fluoride
Ethylidene difluoride
Refrigerant 152a

Liquefied compressed gas — Colorless

Sinks and boils in water. Flammable, irritating vapor is produced. Visible vapor cloud is produced. Boiling point is 76°F.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.

LIQUID
Will burn eyes.
Will cause frostbite.
Harmful if swallowed.

Water Pollution

Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ethylidene difluoride; Ethylidene fluoride; Refrigerant 152a
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula.** CH_3CHF_2
3.4 **IMCO/United Nations Numerical Designation:** 2/1030

4 OBSERVABLE CHARACTERISTICS*

4.1 **Physical State (as shipped):** Liquefied compressed gas
4.2 **Color:** Colorless
4.3 **Odor.** Faint

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Individual breathing devices with air supply; neoprene gloves; protective clothing; eye protection.
5.2 **Symptoms Following Exposure:** Inhalation of concentrated gas will cause suffocation. Contact with liquid can damage eyes because of low temperature. Frostbite may result from contact with liquid.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air; use artificial respiration if necessary. EYES: get medical attention if liquid has entered eyes. SKIN: soak in lukewarm water (for frostbite).
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion.** Not pertinent (boils at −24.7°C)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
6.2 **Flammable Limits in Air:** 3.7% – 18%
6.3 **Fire Extinguishing Agents.** Shut off gas source if safe; water to cool adjacent combustibles.
6.4 **Fire Extinguishing Agents Not to be Used:**
6.5 **Special Hazards of Combustion Products:** Irritating hydrogen fluoride fumes may form in fire.
6.6 **Behavior in Fire:** Containers may explode. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

E. I. du Pont de Nemours & Co. (Inc.)
Freon Products Div.
Wilmington, Del. 19898

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A B C D E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 66.05
13.3 **Boiling Point at 1 atm.** −12.4°F = −11.3°C = 248.5 K
13.4 **Freezing Point.** −179°F = −117°C = 156 K
13.5 **Critical Temperature** 236.3°F = 113.5°C = 386.6 K
13.6 **Critical Pressure:** 652 psia = 44.37 atm = 4.50 MN/m
13.7 **Specific Gravity:** 0.98 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 11.25 dynes/cm = 0.01125 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity.** 2.3
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.141
13.12 **Latent Heat of Vaporization** 140.5 Btu/lb = 78.03 cal/g = 3.268 × 10⁵ J/kg
13.13 **Heat of Combustion:** −9,956 Btu/lb = −4,420 cal/g = −185 × 10⁵ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DFA — DIFLUOROPHOSPHORIC ACID, ANHYDROUS

Common Synonyms

Difluorophosphorus acid

Liquid | Colorless | Sharp irritating odor

Reacts violently with water. Irritating gas is produced on contact with water.

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

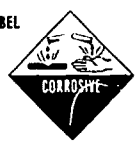
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning; person-contact; water contamination
Restrict access
Evacuate area
Disperse and flush with care

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Difluorophosphorus acid
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** HOPOF$_2$
3.4 **IMCO/United Nations Numerical Designation:** 1768

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color.** Colorless
4.3 **Odor:** Sharp, very irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Air-line mask or self-contained breathing apparatus; full protective clothing
5.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory tract. Contact with liquid causes severe irritation of eyes and skin. Ingestion causes severe burns in mouth and stomach.
5.3 **Treatment for Exposure** Get medical attention as soon as possible following exposure to this compound. INHALATION: remove from exposure and support respiration. EYES: wash with copious volumes of water for at least 15 min. SKIN: wash with large amounts of water for 15 min. INGESTION: if victim is conscious, have him drink large amounts of water followed by milk or milk of magnesia.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Do not use water on adjacent fires
6.5 **Special Hazards of Combustion Products:** Irritating and toxic fumes of hydrogen fluoride and phosphoric acid may be formed in fires
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously to form corrosive and toxic hydrofluoric acid
7.2 **Reactivity with Common Materials** In the presence of moisture is corrosive to glass, other siliceous materials, and most metals
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water; rinse with sodium bicarbonate or lime solution
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Ozark-Mahoning Company
820 South Boulder
Tulsa, Okla. 74119
2. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades or Purity** FP Acid No. 2 90+ Commercial 96+ % plus 3% monofluorophosphoric acid
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting.** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

AO

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	
Water	1
Self-Reaction	0

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 103.0
13.3 **Boiling Point at 1 atm:** 241°F = 116°C = 389°K
13.4 **Freezing Point** −149°F = −95°C = 178°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.553 at 25°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** 130 Btu/lb = ?? cal/g = 3.2 × 10^{5} J/kg
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5-DFA

NOTES

DHP — DIHEPTYL PHTHALATE

Common Synonyms			
Phthalic acid, diheptyl ester	Liquid	White	Odorless
	May float or sink in water		

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Phthalic acid, diheptyl ester
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula:** $C_6H_4(COOC_7H_{15})_2$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation of vapors from very hot material may cause headache, drowsiness and convulsions Contact with eyes may cause irritation
5 3 **Treatment for Exposure:** INHALATION move to fresh air EYES flush with water SKIN wipe off flush with water wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Data not available
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents** Foam dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products**
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 K & K Laboratories Inc
121 Express Street
Plainview N Y 11803

2 Research Organic/Inorganic Chemical Corp
11686 Sheldon
Sun Valley Calif 91352

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1-L-X-1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight:** 362
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point.** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est.) 1.0 at 20°C (liquid)
13 8 **Liquid Surface Tension** Data not available
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Data not available
13 13 **Heat of Combustion:** (est.) = 16,850 Btu/lb = −9,370 cal/g = −392 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and A

NOTES

DBC

DIISOBUTYLCARBINOL

Common Synonyms
2,6-Dimethyl-4-heptanol

Oily liquid Colorless

Floats on water

No discharge if possible
[illegible] department
[illegible] under normal [illegible]
Notify [illegible]

Fire

Combustible
[illegible]
Cool exposed surfaces with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Harmful if swallowed
IF SWALLOWED [illegible] UNCONSCIOUS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
2,6-Dimethyl-4-heptanol

3.2 **Coast Guard Compatibility Classification**
Alcohol

3.3 **Chemical Formula**
$[(CH_3)_2CHCH_2]_2CHOH$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Air supplied mask for prolonged exposure, plastic gloves, goggles

5.2 **Symptoms Following Exposure** None expected

5.3 **Treatment for Exposure:** SKIN AND EYES: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5.5 **Short-Term Inhalation Limits** Not pertinent

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** None

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents,** Carbon dioxide, dry chemical, alcohol foam

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 494°F (bulk)

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 99.0%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3)

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** 144.26

13.3 **Boiling Point at 1 atm:** 352°F = 178°C = 451°K

13.4 **Freezing Point:** −85°F = −65°C = 208°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.812 at 20°C (liquid)

13.8 **Liquid Surface Tension.** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** 140 Btu/lb = [illegible]

13.13 **Heat of Combustion** (est.) = −17,400 Btu/lb = [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5-DBC

NOTES

DBL

DIISOBUTYLENE

Common Synonyms
2,4,4-Trimethyl-1-pentene

Liquid | Colorless | Gasoline like odor

Floats on water. Flammable. Irritating vapor is produced.

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.
[illegible]

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
[illegible]
IF IN EYES, hold [illegible]
IF SWALLOWED [illegible]
DO NOT INDUCE VOMITING.

Water Pollution

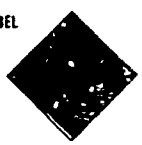
Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

[illegible]

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
2,4,4-Trimethyl-1-pentene

3.2 **Coast Guard Compatibility Classification**
Oil-in

3.3 **Chemical Formula**
$(CH_3)_3CCH_2C(CH_3)=CH_2$

3.4 **IMCO United Nations Numerical Designation**: 1.2 2050

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)**: Liquid

4.2 **Color**: Colorless

4.3 **Odor**: [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment**: [illegible]

5.2 **Symptoms Following Exposure**: [illegible]

5.3 **Treatment of Exposure**: INHALATION: [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)**: [illegible]

5.5 **Short-Term Inhalation Limits**: [illegible]

5.6 **Toxicity by Ingestion**: [illegible]

5.7 **Late Toxicity**: Liver and kidney damage in test animals

5.8 **Vapor (Gas) Irritant Characteristics**: [illegible]

5.9 **Liquid or Solid Irritant Characteristics**: [illegible]

5.10 **Odor Threshold**: [illegible]

6 FIRE HAZARDS

6.1 **Flash Point**: 45°F (C.C.)

6.2 **Flammable Limits in Air**
0.9% LEL (est.)

6.3 **Fire Extinguishing Agents**: Dry chemical, foam or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used**: Water may be ineffective

6.5 **Special Hazards of Combustion Products**: Not pertinent

6.6 **Behavior in Fire**: Not pertinent

6.7 **Ignition Temperature**: 788°F

6.8 **Electrical Hazard**: Not pertinent

6.9 **Burning Rate**: [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water**: No reaction

7.2 **Reactivity with Common Materials**: No reaction

7.3 **Stability During Transport**: Stable

7.4 **Neutralizing Agents for Acids and Caustics**: Not pertinent

7.5 **Polymerization**: Not pertinent

7.6 **Inhibitor of Polymerization**: Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**: Data not available

8.2 **Waterfowl Toxicity**: Data not available

8.3 **Biological Oxygen Demand (BOD)**: Data not available

8.4 **Food Chain Concentration Potential**: None

9 SELECTED MANUFACTURERS

1. B.F. Goodrich Co.
6100 Oak Tree Blvd.
Cleveland, Ohio 44131
2. Petro-Tex Chemical Corp.
8600 Park Place
Houston, Texas 77017
3. Texaco, Inc.
135 East 42nd St.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity**: Research grade, 99.6+% Pure grade, 99.4% Technical grade, 98.7%

10.2 **Storage Temperature**: Ambient

10.3 **Inert Atmosphere**: No requirement

10.4 **Venting**: Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A T U A W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications**: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm**: Liquid

13.2 **Molecular Weight**: 112.22

13.3 **Boiling Point at 1 atm.**
243.7°F = 101.5°C = 374.7°K

13.4 **Freezing Point**
-130.3°F = -94.6°C = 178.5°K

13.5 **Critical Temperature**
536.1°F = 280.1°C = 553.2°K

13.6 **Critical Pressure**
360 psia = 24.5 atm = 2.48 MN/m²

13.7 **Specific Gravity**: 0.715 at 20°C (liquid)

13.8 **Liquid Surface Tension**
20.7 dynes/cm = 0.0207 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
Data not available

13.10 **Vapor (Gas) Specific Gravity**: Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.089

13.12 **Latent Heat of Vaporization**
130 Btu/lb = 72 cal/g = 2.8 × 10⁵ J/kg

13.13 **Heat of Combustion**: -19,900 Btu/lb = -10,500 cal/g = -440 × 10³ J/kg

13.14 **Heat of Decomposition**: None

13.15 **Heat of Solution**: Not pertinent

13.16 **Heat of Polymerization**: Not pertinent

[illegible]

NOTES

REVISED 1978

DIK — DIISOBUTYL KETONE

Common Synonyms
2,6-Dimethyl-4-heptane
5-Diisopropylacetone
Isovalerone
DIBK

Liquid | Colorless | Mild sweet odor

Floats on water

Fire

Combustible

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** DIBK; 2,6-Dimethyl-4-heptanone; Diisopropylacetone; Isovalerone

3.2 **Coast Guard Compatibility Classification:** Ketone

3.3 **Chemical Formula:** $(CH_3)_2CHCH_2COCH_2CH(CH_3)_2$; $C_9H_{18}O$

3.4 **IMCO/United Nations Numerical Designation:** 3.3 1157

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild characteristic ketonic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask in confined areas; plastic gloves; face shield and safety glasses

5.2 **Symptoms Following Exposure:** Inhalation of vapor causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Vapor irritates eyes. Contact with liquid irritates skin.

5.3 **Treatment for Exposure:** INHALATION: move to fresh air, give oxygen if breathing is difficult, call a physician. EYES: flush with plenty of water. SKIN: wipe off, flush with plenty of water, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm

5.5 **Short-Term Inhalation Limits:** 50 ppm/30 min

5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1.4 g/kg (mouse); 5.75 g/kg (rat)

5.7 **Late Toxicity:** Causes increased liver and kidney weights in rats; decreased liver weights in guinea pigs

5.8 **Vapor (Gas) Irritating Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** 131°F (C.C.) 120°F (C.C.)

6.2 **Flammable Limits in Air:** 0.8% - 7.1% at 200°

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** 745

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 65 ppm/24 hr/brine shrimp/TL_m

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** % of theoretical in 5 days: fresh water

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Avenue
New York, N.Y. 10017

2. Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662

3. Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

NTU

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.**
Liquid

13.2 **Molecular Weight:** 142.23

13.3 **Boiling Point at 1 atm.**
325°F = 163°C = 436°K

13.4 **Freezing Point**
-43°F = -42°C = 231°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.806 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
23.92 dynes/cm = 0.02392 N/m at 22°C

13.9 **Liquid-Water Interfacial Tension.**
Data not available

13.10 **Vapor (Gas) Specific Gravity:** 4.9

13.11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent

13.12 **Latent Heat of Vaporization.** 121 Btu/lb
= 67 cal/g = 2.8 × 10⁵ J/kg

13.13 **Heat of Combustion:** -16,049 Btu/lb
= -8,910 cal/g = -37.2 × 10⁶ J/kg

13.14 **Heat of Decomposition.** Not pertinent.

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5-DIK)

NOTES

DID	# DIISODECYL PHTHALATE

Common Synonyms
Phthalic acid, bis (8-methylnonyl) ester
Phthalic acid diisodecyl ester
Plasticizer DDP

Liquid — Colorless

May float or sink in water

Fire

Combustible

Exposure

LIQUID
Not harmful.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Phthalic acid bis(8 methylnonyl) ester, Phthalic acid diisodecyl ester, Plasticizer DDP
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula:** $C_{48}H_{86}O_4$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Faint

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** No symptoms reported for any rate of exposure
5 3 **Treatment for Exposure:** INGESTION: call physician. EYES: flush with water, call physician. SKIN: wipe off, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 450°F CC
6 2 **Flammable Limits in Air:** LEL 0.27% at 508°F
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** 758°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Eastman Chemical Co
Kingsport, Tenn. 37662

2 W. R. Grace & Co.
Hatco Chemical Div.
King George Post Rd.
Fords, N. J. 08863

3 Pfaltz and Bauer, Inc.
375 Fairfield Ave.
Stamford, Conn. 06902

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

ATU

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 446 (theor.)
13 3 **Boiling Point at 1 atm:** Very high
13 4 **Freezing Point:** −58°F = −50°C = 223°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.96 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Data not available
13 13 **Heat of Combustion:** (est.) −16,800 Btu/lb = −9,270 cal/g = −386 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DIP

DIISOPROPANOLAMINE

Common Synonyms
1,1' Imino-2-Propanol
2,2'-Dihydroxydipropylamine

Liquid or solid crystals | Liquid is colorless Solid is white to light yellow | Dead fish or ammonia odor

Liquid floats and mixes with water
Solid sinks and mixes in water

[illegible]

Fire

Combustible

[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID OR SOLID
Will burn skin and eyes
Harmful if swallowed

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Dispense and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
2,2'-Dihydroxydipropylamine
1,1'-Iminodi-2-propanol

3.2 **Coast Guard Compatibility Classification:**
Miscellaneous

3.3 **Chemical Formula:**
$(CH_3CHOHCH_2)_2NH$

3.4 **IMCO United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)**
Liquid or solid

4.2 **Color:** Colorless

4.3 **Odor:** Fishy ammoniacal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible] required clean body-covering clothing, rubber gloves, [illegible] shield

5.2 **Symptoms Following Exposure:** Vapor [illegible] prolonged liquid will burn eyes and skin

5.3 **Treatment for Exposure:** INHALATION: [illegible] INGESTION: [illegible] EYE: [illegible] SKIN: [illegible] 15 min. For eyes, get medical [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} [illegible] g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor [illegible] personnel will notice [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible] skin and [illegible] show exposure and [illegible]

5.10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** 260°F O.C.

6.2 **Flammable Limits in Air:**
[illegible] (calculated) (Not tested)

6.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 500°F (calculated)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Michigan 48640

2. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 97%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

XPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effects	2
Reactivity	
Other Chemicals	1
Water	0
Self Reactive	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid or solid

13.2 **Molecular Weight:** 133.19

13.3 **Boiling Point at 1 atm.**
478°F = 248°C = 521°K

13.4 **Freezing Point:** 109.4°F = 43°C = 316°K

13.5 **Critical Temperature:**
[illegible]

13.6 **Critical Pressure:**
529 psia = 36 atm = 3.6 MN/m²

13.7 **Specific Gravity:** 1.090 at 43°C (liquid)

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization.**
[illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

REVISED 1978

DIA	# DIISOPROPYLAMINE

Common Synonyms	Liquid	Colorless	Fishy odor
	Floats and mixes with water		

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

LIQUID
Will burn eyes
Irritating to eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, water contaminant, air contaminant
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Miscellaneous amine
3.3 **Chemical Formula:** $(CH_3)_2CHNHCH(CH_3)_2$ or $C_6H_{15}N$
3.4 **IMCO/United Nations Numerical Designation:** 1158

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Amine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask, plastic gloves, face goggles, rubber apron
5.2 **Symptoms Following Exposure:** Inhalation of vapors causes irritation, sometimes with nausea and vomiting; can also cause burns to the respiratory system. Ingestion causes irritation of mouth and stomach. Vapor irritates eyes; liquid causes severe burns like caustic. Contact with skin causes burns.
5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air and keep him quiet and comfortable; warm, give oxygen if breathing is difficult; call a physician. PATIENT INDUCE vomiting; give large volume of warm salt water; consult a physician. EYES: *immediately* flush eyes with plenty of water for at least 15 min; then get medical care. SKIN: flush with water, remove contaminated clothing and wash skin; if there is any redness or evidence of burning consult a physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** Minor LC_{L_0} = 5000 ppm for 20 min
5.6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} = 0.7 g/kg (rats)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin; first degree burns on short exposure; may cause second degree burns on long exposure
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 20°F (O.C.), 35°F (C.C.)
6.2 **Flammable Limits in Air:** 0.8% - 7.1%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back
6.7 **Ignition Temperature:** 600°F
6.8 **Electrical Hazard:** Class I
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May attack some forms of plastics
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
(a) 60 ppm, 24 hr, creek chub, lethal, fresh water
(b) 60 ppm,* creek chub, critical range, fresh water
*Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Avenue
New York, N.Y. 10017
2. Pennwalt Corporation
Three Parkway
Philadelphia, Pa. 19102
3. Virginia Chemicals Inc.
3330 W. Norfolk Rd.
Portsmouth, Va. 23703

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial 100%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

VPQRS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicants	-
Aquatic Toxicants	-
Aesthetic Effect	-
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 101.19
13.3 **Boiling Point at 1 atm:** 153.9°F = 67.7°C = 341.1°K
13.4 **Freezing Point:** -141.1°F = -96.2°C = 177.0°K
13.5 **Critical Temperature:** 480.1°F = 249.0°C = 522.2°K
13.6 **Critical Pressure:** (est.) 400 psia = 30 atm = 2.8 MN/m²
13.7 **Specific Gravity:** 0.719 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 19 (calculated) dynes/cm = 0.019 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.064
13.12 **Latent Heat of Vaporization:** 121 Btu/lb = 67 cal/g = 2.82 × 10⁵ J/kg
13.13 **Heat of Combustion:** -19,500 Btu/lb = -11,000 cal/g = -460 × 10³ J/kg
13.14 **Heat of Decomposition:** No pertinent
13.15 **Heat of Solution:** -240 Btu/lb = -134 cal/g = -5.5 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 1044)

NOTES

DIH	DIISOPROPYLBENZENE HYDROPEROXIDE

Common Synonyms Isopropylcumyl hydroperoxide	Liquid Colorless to pale yellow Sharp, unpleasant odor May float or sink in water
Fire	Combustible Will increase the intensity of a fire May cause fire on contact with combustibles Containers may explode in fire
Exposure	VAPOR Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning oxidizing material
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Isopropylcumyl hydroperoxide

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:**
(CH3)2CHC6H4C(CH3)2OOH
or (CH3)2CHC6H4C(CH3)2OOH

3 4 **IMCO/United Nations Numerical Designation:** 3109

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to pale yellow

4 3 **Odor:** Sharp, disagreeable

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Solvent resistant gloves chemical resistant apron chemical goggles or face shield, self-contained breathing apparatus

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat Contact with eyes or skin causes throbbing sensation and irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air call a doctor EYES flush with water for 15 min holding eyelids open call physician SKIN wash several times with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 174°F (C C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Foam, dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Flammable alcohol and ketone gases are formed in fire

6 6 **Behavior in Fire:** Burns with a flare effect Containers may explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Aluminum copper, brass lead zinc salts, mineral acids, oxidizing or reducing agents all can cause rapid decomposition

7 3 **Stability During Transport:** Unstable slowly evolves oxygen

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Hercules, Inc
Wilmington, Del 19899

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** 54 06% the balance being diisopropylbenzene a combustible hydrocarbon

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

5 E1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Organic Peroxide

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classification:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 194 26

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 174°F = 79°C = 352K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 956 at 15°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Data not available

3 14 **Heat of Decomposition** Data not available

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page and 8

NOTES

DAC — DIMETHYLACETAMIDE

Common Synonyms			
N,N Dimethylacetamide Acetic acid dimethylamide	Liquid	Colorless	Weak fishy odor
	Mixes with water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** N,N Dimethylacetamide
Acetic acid dimethylamide
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** C_4H_9ON ($CH_3CON(CH_3)_2$)
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Weak fishy

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Liquid causes mild irritation of eyes and skin. Ingestion causes depression, lethargy, confusion and disorientation, visual and auditory hallucinations, perceptual distortions, delusions, emotional detachment, and affective beating
5 3 **Treatment for Exposure:** EYES: flush with quants of water for 15 min, get medical attention. SKIN: flush with plenty of water for 15 min. INGESTION: induce vomiting and follow with gastric lavage and saline cathartics. Treatment for liver and kidney injury is supportive and symptomatic
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 1 oral LD_{50} = 5.63 g/kg (rat)
5 7 **Late Toxicity:** May produce chronic liver and kidney damage
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** 46.8 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 158°F (70°C)
6 2 **Flammable Limits in Air:** 1.8% - 11.5%
6 3 **Fire Extinguishing Agents.** Water, dry chemical, alcohol foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 914°F
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** 2.5 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. E I duPont de Nemours & Co Inc
Biochemicals Department
1007 Market Street
Wilmington, Del 19898
2. BASF Wyandotte Corp
1609 Biddle Avenue
Wyandotte, Mich 48192
3. Pfaltz and Bauer Inc
126-02 Northern Boulevard
Flushing, N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NPQ

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 87.1
13 3 **Boiling Point at 1 atm:** 165°C = 438°K
13 4 **Freezing Point:** -20°C = 253°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.943 at 20°C (liquid)
13 8 **Liquid Surface Tension.** 34 dynes/cm = 0.034 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** 218 Btu/lb = 121 cal/g = 4.98 × 10⁵ J/kg
13 13 **Heat of Combustion:** -7,560 Btu/lb = -4,200 cal/g = -292 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DMA — DIMETHYLAMINE

Common Synonyms

Liquefied compressed gas Colorless Dead fish or ammonia odor

Floats and boils on water Flammable irritating vapor is produced
Boiling point is 44° F

As with contact with liquid and vapor, keep people away.
Wear suggested protective clothing and equipment including self-contained breathing apparatus.
Stop flow of gas if possible.
Stop discharge if possible.
Use water spray to reduce vapors or divert vapor cloud drift.
Isolate and ventilate area before entering.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur
May explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus when fighting fire.
Stop flow of gas if possible.
If container is not leaking, cool with water from protected location.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause difficult breathing
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
Harmful if swallowed
Keep victim warm and quiet.
Flush affected area with plenty of water.
IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, induce vomiting.

Water Pollution

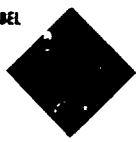
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Hazardous Materials Handbook, CG-446-6

Isolate hazard area and deny entry.
Keep unnecessary people away.
Evacuate area.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** N-methylmethanamine

3.2 **Coast Guard Compatibility Classification:** None

3.3 **Chemical Formula:** $(CH_3)_2NH$

3.4 **IMCO United Nations Numerical Designation:** 2.0 /037

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Fishy, ammonia-like odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles and face shield if needed. Wear self-contained breathing apparatus.

5.2 **Symptoms Following Exposure:** Inhalation of high concentrations may cause pulmonary edema. Liquid causes severe burns.

5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with plenty of water for at least 15 minutes and then transport victim to hospital for treatment by an ophthalmologist. SKIN: Flush affected area with plenty of water. Remove contaminated clothing and wash before reuse. INGESTION: Induce vomiting if victim is conscious.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm

5.5 **Short-Term Inhalation Limits:** 30 ppm for 30 min

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is irritating to eyes, nose and throat. Not pertinent with physician unless exposed. Does not compel.

5.9 **Liquid or Solid Irritant Characteristics:** Causes severe burns. Not pertinent with physician unless exposed. Does not compel.

5.10 **Odor Threshold:** 0.04 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** -30° F C.C.

6.2 **Flammable Limits in Air:** 2.8% - 14.4%

6.3 **Fire Extinguishing Agents:** Stop flow of gas. Use water spray, alcohol foam, carbon dioxide, dry chemical or foam to cool containers.

6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water jet.

6.5 **Special Hazards of Combustion Products:** Vapors are extremely irritating and corrosive.

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 806° F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.3 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No hazardous reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Stopped 24 h, undiluted fresh water >100 ppm; 48 h, undiluted salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Commercial Solvents Corp
245 Park Ave
New York, N.Y. 10017

2. Gulf Corp
Chemical Division
Calvert City, Ky. 42029

Pennwalt Hazleton
Independence Mall West
Philadelphia, Pa. 19105

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous 98% Aqueous solutions 25%, 40%, 50%, 60%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

ABCKEMS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Toxicity	3
Liquid or Solid Toxicity	3
Poison	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Marine Toxicity	2
Reactivity	
Org. Peroxide	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Toxicity)	3
Flammability (Fire)	4
Reactivity (Explosion)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 45.08

13.3 **Boiling Point at 1 atm:** 44° F = 6.8° C = 280 K

13.4 **Freezing Point:** -134° F = -92° C = 181 K

13.5 **Critical Temperature:** 329° F = 165° C = 438° K

13.6 **Critical Pressure:** 765 psia = 52 atm = 5.3 MN/m²

13.7 **Specific Gravity:** 0.678 at 68° F (20° C)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.6

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.14

13.12 **Latent Heat of Vaporization:** 10,700 Btu/lb-mol = 6,000 cal/g = 25,000 J/kg

13.13 **Heat of Combustion:** -14,500 Btu/lb = -8,050 cal/g = -336 x 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** -1,100 Btu/lb = -610 cal/g = -2.55 x 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

DMD — DIMETHYLDICHLOROSILANE

Common Synonyms

Liquid Colorless Sharp irritating odor

Reacts violently with water. Irritating gas is produced on contact with water.

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]
DO NOT USE WATER ON FIRE

Exposure

VAPOR
Irritating to eyes, nose and throat
[illegible]

LIQUID
Will burn skin and eyes
Harmful if swallowed
[illegible]
IF SWALLOWED [illegible]
[illegible]

Water Pollution

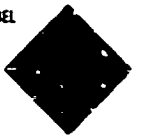
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Immediate Precautionary Measures
[illegible]
Removal Procedures
Evacuation Areas
Disposal Method: Burn with care

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]
3.2 Coast Guard Compatibility Classification: Not applicable
3.3 Chemical Formula: $(CH_3)_2SiCl_2$
3.4 IMCO/United Nations Numerical Designation: 1162

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Sharp irritating odor

5. HEALTH HAZARDS

5 Personal Protective Equipment: Acid vapor type respirator. Impervious clothing, chemical safety goggles, other protective equipment as necessary to prevent skin and eye contact.

5.2 Symptoms Following Exposure: Inhalation creates mucous membranes of nose to throat to lungs and severe burns of eyes and skin. Ingestion burns mouth, throat and stomach.

5.3 Treatment for Exposure: INHALATION: remove from exposure and apply artificial respiration if necessary, oxygen if available. EYES: flush with water for 15 min. Seek medical attention immediately. SKIN: flush with water. Wash with soap and water. Seek medical attention immediately. INGESTION: if conscious, induce vomiting by drinking large amounts of water. Do not induce vomiting if victim is unconscious.

5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available

5.5 Short Term Inhalation Limits: Data not available

5.6 Toxicity by Ingestion: Grade 4. Dose: 50-500 mg/kg

5.7 Late Toxicity: Data not available

5.8 Vapor (Gas) Irritant Characteristics: Vapor causes severe irritation to eyes and throat and can cause eye and lung injury. Does not cause delayed effects after exposure ceases.

5.9 Liquid or Solid Irritant Characteristics: Severe irritant. Causes severe skin burns and eye damage on contact. Can cause severe damage to the eyes.

5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water or foam
6.5 Special Hazards of Combustion Products: Hydrogen chloride and phosgene may be produced
6.6 Behavior in Fire: Difficult to ignite. Reacts with water and forms flammable hydrogen gas. Vapor is heavier than air and may travel to source of ignition and flash back.
6.7 Ignition Temperature: Above 70°F
6.8 Electrical Hazard: Data not available
6.9 Burning Rate: [illegible]

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: Reacts violently with water, generating hydrogen chloride gas. Hydrogen chloride gas forms hydrochloric acid in contact with moisture.
7.2 Reactivity with Common Materials: Will react with surface moisture on containers to generate hydrogen chloride which can cause containers to rupture.
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Sodium bicarbonate or lime
7.5 Polymerization: Will not occur
7.6 Inhibitor of Polymerization: Not applicable

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: [illegible]

9 SELECTED MANUFACTURERS

[illegible]
Chemicals and Plastics Div.
[illegible] Park Avenue
New York, NY [illegible]

[illegible]
P.O. Box [illegible]
Midland, Michigan [illegible]

General Electric Co.
Silicone Products Department
Waterford, NY [illegible]

10. SHIPPING INFORMATION

10.1 Grades of Purity: [illegible]
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

AO

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Flammable liquid
12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating
Fire	
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemicals	
Water	4
Self Reactive	

12.3 NFPA Hazard Classifications

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 129
13.3 Boiling Point at 1 atm: [illegible]
13.4 Freezing Point: [illegible]
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: [illegible]
13.8 Liquid Surface Tension: [illegible]
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: 3.4
13.11 Ratio of Specific Heats of Vapor (Gas): Data not available
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Data not available
13.16 Heat of Polymerization: Not pertinent

Comments on Properties

NOTES

DIM — DIMETHYL ETHER

Common Synonyms

Methyl ether

Liquefied gas | Colorless | Pleasant odor

Floats and boils on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR

Irritating to eyes, nose and throat.
If inhaled will cause headache, dizziness, or loss of consciousness.

LIQUID

Irritating to skin and eyes.
Will cause frostbite.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Manual, CG-446-4)

Issue warning. Keep flammables, Restrict access. Evacuate area.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Methyl ether; Wood ether

3.2 **Coast Guard Compatibility Classification:** Ether(2)

3.3 **Chemical Formula:** CH_3OCH_3

3.4 **IMCO/United Nations Numerical Designation:** 2 1033

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid under pressure

4.2 **Color:** Colorless

4.3 **Odor:** Slightly sour-sweet

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Mask for organic vapor; plastic or rubber gloves; safety shoes

5.2 **Symptoms Following Exposure:** Inhalation produces an anesthesia at less than that of ether; others: blurring of vision, headache, unconsciousness. Liquid or concentrated vapor contact causes frostbite. Contact of liquid with skin may cause frostbite.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure and support respiration. If [illegible] with water for at least [illegible] minutes. EYES: consult an eye specialist. SKIN: [illegible] by use of mild soap and water or by wrapping the affected parts in blanket.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (flammable gas)

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Let fire burn; shut off gas flow; cool exposed surroundings with water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Containers may explode. Vapors are heavier than air and may travel long distance to a source of ignition and flash back.

6.7 **Ignition Temperature:** 662 F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. [illegible]

2. Matheson Gas Products
East Rutherford, N.J. 07073

3. Phillips and Bauer Inc.
[illegible] Northern Boulevard
Flushing, N.Y. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

ABCKLMN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 46

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1455

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

DMF — DIMETHYLFORMAMIDE

Common Synonyms
N,N Dimethylformamide
DMF

Watery liquid | Colorless | Slight ammonia odor

Floats and mixes with water

Fire

Combustible

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Restrict access
Disperse and flush

2. LABELS

No hazard label is required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.**
N,N Dimethylformamide
DMF

3 2 **Coast Guard Compatibility Classification**
Amide

3 3 **Chemical Formula**
HCON(CH3)2

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color** Colorless

4 3 **Odor** Slight ammoniacal or essentially odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Safety glasses or face shield, rubber apron and boots

5 2 **Symptoms Following Exposure** Irritation of eyes, skin and nose. May cause nausea

5 3 **Treatment for Exposure.** INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration; if breathing is difficult, give oxygen. SKIN OR EYES: flush with plenty of water while removing contaminated clothing and shoes.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 10 ppm

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion.** Grade 1 Dose: 50 to 15 g/kg (rat)

5 7 **Late Toxicity** Causes abortions in pregnant rats, possibly in humans also

5 8 **Vapor (Gas) Irritant Characteristics** Vapors cause moderate irritation; most exposed personnel will find high concentrations unpleasant. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure.

5 10 **Odor Threshold** 100 ppm

6 FIRE HAZARDS

6 1 **Flash Point** 136°F OC, 136°F CC

6 2 **Flammable Limits in Air.**
2.2 — 15.2%

6 3 **Fire Extinguishing Agents.** Water, foam, carbon dioxide, or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Vapors are irritating

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** 833°F

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** 2.2 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD):** 0.9 lb/lb 5 days

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Air Products and Chemicals, Inc.
Allentown, Pa. 18105

2 E. I. duPont de Nemours & Co., Inc.
Organic Chemicals Dept.
Wilmington, Del. 19898

3 Houghton Chemical Co.
52 Condor St.
Boston, Mass. 02134

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Data not available

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XPQ

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	
Health	
Max. of Irritant	-
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight** 73.09

13 3 **Boiling Point at 1 atm**
307°F = 153°C = 426°K

13 4 **Freezing Point**
-78°F = -61°C = 212°K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 0.950 at 20°C (liquid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** 1.08

13 12 **Latent Heat of Vaporization**
248 Btu/lb = 138 cal/g = 5.78 × 10^5 J/kg

13 13 **Heat of Combustion** -11,280 Btu/lb
= -6267 cal/g = -262.4 × 10^5 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** -63 Btu/lb
= -35 cal/g = -1.5 × 10^5 J/kg

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5-449.1

NOTES

REVISED 1978

DDW — DIMETHYLHEXANE DIHYDROPEROXIDE, WET

Common Synonyms
2,5-Dimethylhexane-2,5-dihydroperoxide
2,5-Dihydroperoxy-2,5-dimethylhexane

Wet solid — White

May float or sink in water

Stop discharge if possible. Keep people away
Call fire department
Avoid contact with spilled material
Isolate and keep unnecessary people away from spill
Notify local health and pollution control agencies

Fire

Not flammable when wet
Will increase the intensity of a fire
May explode if exposed to heat or flames
Flash back fire may occur if water is applied to burning material
Extinguish with dry chemical, foam, carbon dioxide, or water
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If in eyes: Hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk; call physician immediately
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do not induce vomiting; keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: oxidizing material
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2 LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** 2,5-Dihydroperoxy-2,5-dimethylhexane, 2,5-Dimethylhexane-2,5-dihydroperoxide

3.2 **Coast Guard Co. patibility Classification.** Not listed

3.3 **Chemical Formula.** $C_8H_{18}O_4$, H O

3.4 **IMCO/United Nations Numerical Designation** 5.2 1528

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Wet solid

4.2 **Color:** White

4.3 **Odor.** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Contact with eyes or skin causes irritation

5.3 **Treatment for Exposure:** INHALATION: remove from exposure, call a doctor. EYES: wash with large amount of water for at least 15 min. SKIN: wash with large amount of water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective on fire

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire** Decomposes violently when heated in fire. Can increase intensity of fire when in contact with combustible material. Containers may explode

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** Decomposes in contact with many metals and acids

7.3 **Stability During Transport:** Stable below 100°F

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Pennwalt Corporation
Luzidol Division
P O Box 1048
Buffalo N Y 14240

2 Wallace Chemical Corporation
U S Peroxygen Division
850 Morton Avenue
Richmond Calif 94804

3 Polysciences Inc
Paul Valley Industrial Park
Warrington Pa 18976

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Approx 30-45% water
The dry chemical is too hazardous to ship

10.2 **Storage Temperature:** 4-38°C (40-100°F)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight:** 178.2

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** (est.) 1.0 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition** Data not available

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DMH — 1,1-DIMETHYLHYDRAZINE

Common Synonyms
UDMH
Dimazine
unsym-Dimethylhydrazine

Watery liquid | Colorless | Fishy or ammonia-like odor

Floats and mixes with water

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away
Wear protective clothing and self-contained breathing apparatus
Stop flow if possible
Stop spill from spreading by containing runoff with soil or sand
Keep out of sewers, confined areas
Notify fire department

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED WHEN HEATED
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear fire-resistive clothing and self-contained breathing apparatus
Use dry chemical, foam or water
Extinguish with water

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes
Move victim to fresh air
Begin artificial respiration if victim is not breathing
Keep victim quiet and warm

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes
Remove contaminated clothing and shoes immediately
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, induce vomiting by drinking water or milk
DO NOT INDUCE VOMITING

Water Pollution

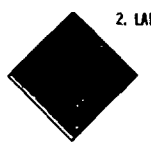
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Evacuate area
Disperse and flush

2. LABELS





3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dimazine
UDMH
unsym-Dimethylhydrazine

3 2 **Coast Guard Compatibility Classification**
Not applicable

3 3 **Chemical Formula:** $(CH_3)_2NNH_2$

3 4 **IMCO, United Nations Numerical Designation** 3 2 1163

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Sharp ammoniacal fish

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Rubber gloves, boots and apron; plastic face shield; Gas mask with ammonia (GMN) canister approved for 30 min. across 1% concentration; for lower ppb or higher concentrations use self-contained breathing apparatus

5 2 **Symptoms Following Exposure** Breathing of vapor causes pulmonary irritation; delayed gastrointestinal irritation, tremors and convulsions. Contact with skin or eyes causes irritation; chronic cases chemical burns. Can be absorbed through skin in toxic amounts; irritation and convulsions

5 3 **Treatment for Exposure** INHALATION: assist with fresh air; compound 1 oxygen if needed; artificial respiration and oxygen if needed; watch for signs of pulmonary edema; a corticosteroid aerosol may be effective. INGESTION: do NOT induce vomiting. Hospitalize. SKIN OR EYES: flood with water; treat as for alkaline burn

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0 ppm

5 5 **Short-Term Inhalation Limits.** 100 ppm for 30 min; 50 ppm for 30 min; 25 ppm for 1 hr

5 6 **Toxicity by Ingestion:** Grade 4; LD_{50} = 300 mg/kg (rat, mouse)

5 7 **Late Toxicity:** Data not available
Mild anemia, upper respiratory irritation, and muscle tremors in dogs following chronic exposure

5 8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating such that personnel will normally tolerate moderate or high concentrations

5 9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact and severe injury to the eyes

5 10 **Odor Threshold:** 0.14 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 34°F (1°C)

6 2 **Flammable Limits in Air:** 2 - 95%

6 3 **Fire Extinguishing Agents** Flood with water

6 4 **Fire Extinguishing Agents Not to be Used** In large fires, water for carbon dioxide and bicarbonate types may allow flash back and explosive re-ignition

6 5 **Special Hazards of Combustion Products** None

6 6 **Behavior in Fire.** Tends to ignite unless diluted with much water

6 7 **Ignition Temperature** 482 - 482°F

6 8 **Electrical Hazard:** Class I, Group D

6 9 **Burning Rate:** 3 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** Dissolves swells and disintegrates many plastics

7 3 **Stability During Transport** Stable below 1112°F

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9. SELECTED MANUFACTURERS

IMC Corporation
Organic Chemicals Division
633 Third Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Propellant grade 96% min

10 2 **Storage Temperature** Below 120°F

10 3 **Inert Atmosphere** Inerted

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q R S

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	2
Acute Shock Effect	2
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	4

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight** 60.11

13 3 **Boiling Point at 1 atm.**
= at 0°F = 63.3°C = 336.5°K

13 4 **Freezing Point:** −71°F = −57°C = 216°K

13 5 **Critical Temperature:**
460°F = 249°C = 522°K

13 6 **Critical Pressure:**
869 psia = 58.5 atm = 5.40 MN/m²

13 7 **Specific Gravity:** 0.791 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
28 dynes/cm = 0.028 N/m at 25°C

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 2.1

13 11 **Ratio of Specific Heats of Vapor (Gas):**
test 1.182

13 12 **Latent Heat of Vaporization:** 261 Btu/lb
= 145 cal/g = 6.07×10^5 J/kg

13 13 **Heat of Combustion** −14,170 Btu/lb
= −7870 cal/g = -329.3×10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** test −30 Btu/lb
= −16 cal/g = -0.6×10^5 J/kg

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5A

NOTES

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DMP — DIMETHYLPOLYSILOXANE

Common Synonyms

Poly (dimethylsiloxane)
Dimethyl silicone oil
Silicone fluids
Dimethyl silicone fluids

Liquid | Colorless | Odorless

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be recovered
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Poly (dimethylsiloxane)
Dimethylsilicone oil, Silicone fluids
Dimethyl silicone fluids

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula**
$(CH_3)_3SiO[Si(CH_3)_2O]_nSi(CH_3)_3$

3 4 **IMCO/United Nations Numerical Designation** Not Listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Safety goggles

5 2 **Symptoms Following Exposure.** Contact of liquid with eyes may cause temporary discomfort
Does not penetrate skin Harmless when ingested

5 3 **Treatment for Exposure** Eyes Flood eyes continuously for several minutes using water irrigation
EYES flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity** None

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** 275 (135 C) OC

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents.** Foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** 820 (360 C)

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Dow Corning Corporation
South Saginaw Road
Midland Mich 48640

2 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity** A series of compounds having viscosities of from 50 to 100,000 cs available

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

NUXA

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** Not pertinent

13 3 **Boiling Point at 1 atm**
> 300 F = > 149 C = > 422 K

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 0.98 at 20 C (liquid)

13 8 **Liquid Surface Tension:**
19.21 dynes/cm = 0.019 0.021 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension.** (est.)
30 dynes/cm = 0.030 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion** (est.) = -(1000 Btu/lb = -6,900 cal/g = -260 X 10^3 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

DSF — DIMETHYL SULFATE

Common Synonyms			
Methyl sulfate	Liquid	Colorless	Mild onion odor

Sinks and mixes slowly with water

Fire

Combustible
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Isolate spring, poison and notify
Protect access
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
No common synonyms

3.2 **Coast Guard Compatibility Classification:**
Fair

3.3 **Chemical Formula:** $(CH_3)_2SO_4$

3.4 **IMCO United Nations Numerical Designation:** 6.1/1595

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Small characteristic odor
slight, not distinctive, weak onion

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles; self-contained breathing apparatus; rubber shoes; rubber gloves; safety boots and coveralls impervious to chemical

5.2 **Symptoms Following Exposure:** Severe irritation to eyes, eyelids, respiratory tract and skin
Dry pain, tearing, burning, white spots, difficulty in breathing, malaise and fever
Inflammation, edema of lungs

5.3 **Treatment for Exposure:** Contact with dimethyl sulfate (liquid or vapor) may require immediate treatment. Call physician even if there is no evidence of illness. Symptoms may not appear for several hours. INHALATION of vapors: get to fresh air immediately. If not breathing, give artificial respiration. If breathing is weak, inhale by demand inhalator. Keep victim warm and quiet. Keep under observation at least 48 hours because of danger of delayed pulmonary edema. Perhaps physician may administ[illegible] under pressure. INGESTION: DO NOT induce vomiting. SKIN: Remove contaminated clothing. Wash with soap or mild detergent and water for at least 15 minutes. EYES: Wash with running water for at least 15 minutes.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 3; Oral LD50 = 205 mg/kg

5.7 **Late Toxicity:** Causes birth defects in rat (malignant tumors in nervous system)

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat, and in advanced case lung injury. They cannot be tolerated even at low concentration.

5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on prolonged contact in concentrated form.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 240 F (OC) 182 F (CC)

6.2 **Flammable Limits in Air:**
Data not available

6.3 **Fire Extinguishing Agents.** Water, foam, carbon dioxide or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used.**
Not pertinent

6.5 **Special Hazards of Combustion Products:**
Flammable toxic vapors generated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 370°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Slow
non-hazardous reaction

7.2 **Reactivity with Common Materials.**
Corrodes metal when wet

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate or lime

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

E. I. duPont de Nemours & Co., Inc.
Industrial and Biochemicals Dept.
Wilmington, Del. 19898

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-Vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A-P-Q-A-Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicants	4
Aquatic Toxicants	x
Aesthetic Effect	*
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 126.13

13.3 **Boiling Point at 1 atm**
370.5°F = 188.5°C = 462.0°K

13.4 **Freezing Point.**
−25.2°F = −31.8°C = 241.4°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.33 at 15°C (liquid)

13.8 **Liquid Surface Tension**
40.1 dynes/cm = 0.0401 N/m at 15°C

13.9 **Liquid-Water Interfacial Tension:**
not 120 dynes/cm = 0.02 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization**
Not pertinent

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

NOTES

REVISED 1978

DSL

DIMETHYL SULFIDE

Common Synonyms

Methyl sulfide
2 Thiapropane
Methanethiomethane

Liquid | Colorless to light yellow | Unpleasant odor

Floats and mixes slowly with water. Irritating vapor is produced. Boiling point is 99° F.

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR

Irritation to eyes, nose and throat.

LIQUID

Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. High flammability.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** DMS
Methanethiomethane
Methyl sulfide
2-Thiapropane

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula** C_2H_6S

3.4 **IMCO/United Nations Numerical Designation.** 3.1 1164

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color.** Colorless to straw

4.3 **Odor** Ethereal, pungent and disagreeable odor at low concentrations

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Respirator with organic vapor cartridge, rubber or plastic gloves, goggles or face shield.

5.2 **Symptoms Following Exposure** Inhalation causes moderate irritation of upper respiratory system. Contact of liquid with eyes causes moderate irritation. Repeated contact with skin may extract oils and results in irritation. Ingestion causes nausea and irritation of mouth and throat.

5.3 **Treatment for Exposure** INHALATION: If not serious, remove to fresh air; if serious, get medical attention immediately. EYES: flush with water for at least 15 min.; if irritation persists, get medical attention. SKIN: flush with plenty of water and wash thoroughly; get treatment for any lasting irritation. INGESTION: If large amounts are swallowed, induce vomiting by tickling the back of the throat with the fingers or by giving an emetic such as two tablespoons of mustard in a glass of warm water; get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available.

5.5 **Short-Term Inhalation Limits:** Data not available.

5.6 **Toxicity by Ingestion** Grade 2; oral LD_{50} = 2.45 mg/kg (rats).

5.7 **Late Toxicity** Data not available.

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating to eyes and nose; personnel can usually tolerate moderate to high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics** Causes severe irritation of the skin and first degree burns on short exposure and may cause second degree burns on long exposure.

5.10 **Odor Threshold:** 0.001 ppm

6. FIRE HAZARDS

6.1 **Flash Point** −46 [illegible] C

6.2 **Flammable Limits in Air** 2.2 [illegible]

6.3 **Fire Extinguishing Agents** Dry chemical, foam, Kohol foam, carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective.

6.5 **Special Hazards of Combustion Products** Toxic and irritating sulfur dioxide is formed.

6.6 **Behavior in Fire** Vapor is heavier than air and may travel considerable distance to source of ignition and flash back.

6.7 **Ignition Temperature** 403° F

6.8 **Electrical Hazard** Data not available.

6.9 **Burning Rate** 4.8 mm/min.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Approximately 1 lb/lb

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Crown Zellerbach Corp
Chemical Products Division
Camas, Wash. 98607

2. Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville, Okla. 74004

3. United States Steel Corp.
USS Chemicals Division
P. O. Box 86
Pittsburgh, Pa. 15230

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting.** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VPQTUVW

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Toxicity	2
Liquid or Solid Contact	2
Poisons	2
Water Pollution	
Human Toxicants	
Aquatic Toxicants	2
Aesthetic Insults	4
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 62.1

13.3 **Boiling Point at 1 atm**
99°F = 37° C = 310° K

13.4 **Freezing Point:**
−144°F = −98° C = 175° K

13.5 **Critical Temperature**
444°F = 229° C = 502° K

13.6 **Critical Pressure**
826 psia = 56 Atm = 5.69 MN/m

13.7 **Specific Gravity** 0.85 at 20° C (liquid)

13.8 **Liquid Surface Tension:**
26.7 dynes/cm = 0.0267 N/m at 11° C

13.9 **Liquid-Water Interfacial Tension** (est.)
30 dynes/cm = 0.030 N/m at 20° C

13.10 **Vapor (Gas) Specific Gravity:** 2.14

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.1277 at 16° C

13.12 **Latent Heat of Vaporization** 192 Btu/lb
= 108 cal/g = 4.52 × 10⁵ J/kg

13.13 **Heat of Combustion** −13,200 Btu/lb
= −7340 cal/g = −307 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page 7 and A

NOTES

DMS	DIMETHYL SULFOXIDE

Common Synonyms
Methyl Sulfoxide
DMSO

Liquid | Colorless | Mild garlic odor

Sinks and mixes with water

No discharge if possible
Call fire department
Avoid contact if leaking
Evacuate and remove discharged material
Notify [illegible] agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles, self-contained breathing apparatus and rubber protective clothing
Extinguish with water fog, carbon dioxide, dry chemical or foam

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids apart and flush with plenty of water

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
Notify [illegible]
Notify [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-1

Disperse and flush

2. LABELS

No hazard labels required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
DMSO
Methyl sulfoxide

3 2 **Coast Guard Compatibility Classification:**
Not applicable

3 3 **Chemical Formula:** CH_3SOCH_3

3 4 **IMCO United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor** Slight garlic or odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, safety goggles, Respirator, Protective clothing, Chemical cartridge respirator or dust mask if exposed

5 2 **Symptoms Following Exposure:** Slight eye irritation

5 3 **Treatment for Exposure** Wash eyes and skin with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 0 above 10 g/kg

5 7 **Late Toxicity** Causes damage to eye in dogs, pigs, rats and rabbits

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. Repeated or prolonged skin contact may cause drying and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 203 F (OC) 95 C (OC)

6 2 **Flammable Limits in Air**
[illegible]

6 3 **Fire Extinguishing Agents:** Water fog, foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** Sulfur dioxide, formaldehyde and methane in enclosed areas or confined spaces

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 572 F

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate:** 2.0 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** 24,500 ppm 48 hr Mosquito Fish in fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Crown Zellerbach Corp
Chemical Products Div
Bush, N
Stauffer Chemical Co

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open (flame arrester or pressure vacuum)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-2

NPQ

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 78.13

13 3 **Boiling Point at 1 atm:** 374.2 F = 462.2 K = 189 C

13 4 **Freezing Point:** 65.8 F = 291.8 K = 18.5 C

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.100 at 20 C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** 189 Btu/lb = 105 cal/g = 439 J/g

13 13 **Heat of Combustion:** -10,500 Btu/lb = -5,830 cal/g = -24,400 J/g

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** -347 Btu/lb = -193 cal/g = -808 J/g

13 16 **Heat of Polymerization.** Not pertinent

NOTES

REVISED 1978

DMT — DIMETHYL TEREPHTHALATE

Common Synonyms	Solid or heated liquid	White solid or colorless liquid	Odorless
Terephthalic acid dimethyl ester	Liquid solidifies	Solid and liquid sink in water	

Fire	Combustible
Exposure	DUST Not harmful LIQUID OR SOLID Heated liquid will burn skin and eyes. Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment (if floating)
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Terephthalic acid dimethyl ester

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_6H_4(COOCH_3)_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or liquid

4 2 **Color:** Colorless

4 3 **Odor:** Not appreciable

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Mixed DMT: goggles and head coverings and protective clothing. Solid dust: mask, goggles

5 2 **Symptoms Following Exposure:** Mixed DMT and dust: severe irritation to eyes

5 3 **Treatment for Exposure:** EYES: flush dust from eyes with water. SKIN: wash with soap and water. If burned by molten DMT, flush area immediately with cold water for at least 5 min. Do not apply ice pack for at least 30 min. If molten DMT splashed on skin, do not scrape off DMT that has penetrated, because this will remove underlying skin. Seek prompt medical treatment for significant burns

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 1; oral LD_{50} = 4,100 mg/kg (rats)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 290 F (OC) (molten)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water; dry chemical; foam; carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 1,050 F (dust)

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Hercules Incorporated
Synthetics Department
910 Market Street
Wilmington, Del. 19899

2. Amoco Chemicals Corporation
200 East Randolph Drive
Chicago, IL 60601

3. E. I. duPont de Nemours & Company, Inc.
Polymer Intermediates Department
Wilmington, Del. 19898

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** 99.9

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** Inert gas blanket is advisable

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XIUXXII

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 194.2

13 3 **Boiling Point at 1 atm:** 518°F = 270°C = 543°K

13 4 **Freezing Point:** 284°F = 140°C = 413°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.37 (solid) 1.08 at 325°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 12 Btu/lb = 6.7 cal/g = 2.81 × 10⁴ J/kg

13 13 **Heat of Combustion:** −0.110 Btu/lb = −6,300 cal/g = −2.64 × 10⁷ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

DMZ — DIMETHYLZINC

Common Synonyms

Zinc dimethyl
Zinc methyl
Methylzinc

Liquid Colorless

IGNITES WHEN EXPOSED TO AIR. Reacts violently with water and produces flammable vapor.

Fire

IGNITES WHEN EXPOSED TO AIR
Irritating gases are produced when heated

Exposure

VAPOR OR MIST
Irritating to eyes, nose and throat
If inhaled will cause headache, nausea, vomiting or difficult breathing

LIQUID
Will burn skin and eyes
If swallowed will cause nausea, or vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning: high flammability
Keep unnecessary people away
Isolate hazard area

2 LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Zinc dimethyl
Zinc methyl
Methylzinc

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula.** $(CH_3)_2Zn$

3.4 **IMCO/United Nations Numerical Designation:** 4.2 / 1370

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Not pertinent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Canister type gas mask (approved for use as PVC fire chemical and asbestos eight glass full face shield safety glasses impervious clothing and gloves Do not breathe vapor or mist Avoid contact with liquid and vapor

5.2 **Symptoms Following Exposure:** Inhalation of mist or vapor causes immediate irritation of upper respiratory tract Excessive or prolonged inhalation of fumes may cause metal fume fever Effects may be delayed Symptoms are headache fever chills nausea vomiting muscular aches perspiration sometimes a sweet taste dryness weakness and at times prostration Symptoms usually last 12 24 hrs Eyes are immediately and severely irritated by liquid and vapor Skin contact causes burns Burns are removed with flush of water Chemicals are permanent damage to eyes Skin will undergo chemical and heat burns when chemical reacts with moisture in skin Unless washed quickly no pain may be noticed Treat as above but with the same precautions as concentrated liquid Ingestion of liquid will cause immediate burns at site of contact Nausea vomiting cramps and diarrhea may follow Tissues may ulcerate if not treated

5.3 **Treatment for Exposure:** INHALATION Artificial respiration if vapor either ignites spontaneously or reacts with moisture to form methane and zinc oxide Move victim to clean air and administer mouth to mouth resuscitation if breathing has ceased give oxygen only when authorized by physician keep victim warm and comfortable call physician immediately EYES immediately flush with large amounts of water for at least 15 min holding eyelids apart to insure flushing of entire eye surface use eye irrigation equipment only when directed by physician and do not attempt to neutralize with chemicals get medical attention as soon as possible SKIN immediately flush affected area with large volumes of water do not attempt to neutralize with chemicals get medical attention if irritation persists INGESTION Highly unlikely as liquid or vapor either

Continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
Ignites upon exposure to air

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, sand, powdered limestone

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam, halogenated agents, carbon dioxide

6.5 **Special Hazards of Combustion Products:** Smoke contains zinc oxide which can irritate lungs and cause metal fume fever

6.6 **Behavior in Fire:** Reacts spontaneously with air or oxygen and violently with water Highly flammable in contact with water applied to adjacent fires will cause ignition

6.7 **Ignition Temperature:** Below 0°C

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously generating flammable methane gas

7.2 **Reactivity with Common Materials:** Will react with surface moisture to generate flammable methane

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Not pertinent

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Texas Alkyls, Incorporated
P O Box (illegible)
Deer Park, Texas 77536

Ventron Corporation
Alfa Products
Beverly, Mass 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, Electronic

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Dry nitrogen gas

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

LOF

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 95.4

13.3 **Boiling Point at 1 atm.**
(illegible)

13.4 **Freezing Point:** (illegible)

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.386 at 0°C (liquid)

13.8 **Liquid Surface Tension:** (cont.)
19 dynes/cm = 0.019 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization.**
(illegible)

13.13 **Heat of Combustion.** Data not available

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

5 HEALTH HAZARDS (Cont'd)

(illegible) spontaneously with reaction with moisture to form methane and zinc oxide Do NOT induce vomiting Inhalation of decomposition gas in large amounts of water especially if vomiting occurs give more fluids when victim regains consciousness may be given for their soothing effect get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits.** Not pertinent

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Not pertinent

DNT	2,4-DINITROANILINE

Common Synonyms
2,4 Dinitroaniline

Solid powder or crystals Yellow Musty odor

Sinks in water

AVOID CONTACT WITH [illegible]

Fire

Combustible
May explode if subjected to heat or flame
POISONOUS GAS IS PRODUCED WHEN HEATED

Exposure

SEE FOR MEDICAL AID

DUST
POISONOUS IF INHALED

SOLIDS
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes

IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
2,4 Dinitroaniline

3 2 **Coast Guard Compatibility Classification:**
Not applicable

3 3 **Chemical Formula:**
$NH_2C_6H_3(NO_2)_2$-2,4

3 4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** Slight musty

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus, [illegible] goggles, plastic laboratory protective shoes

5 2 **Symptoms Following Exposure:** May cause headache, [illegible] mucous membrane

5 3 **Treatment for Exposure:** INHALATION [illegible] INGESTION induce vomiting, give universal antidote, get prompt medical care CONTACT WITH SKIN AND EYES remove contaminated clothing, wash exposed skin with water, flush eyes with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 3, oral rat LD_{50} = 418 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:**
Causes smarting of the skin and first degree burns on short exposure, may cause second degree burns on long exposure

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** [illegible]

6 2 **Flammable Limits in Air:**
Data not available

6 3 **Fire Extinguishing Agents:** [illegible] fires use water, dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water [illegible]

6 5 **Special Hazards of Combustion Products:**
May [illegible] oxides of nitrogen

6 6 **Behavior in Fire:** May explode

6 7 **Ignition Temperature:**
Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Not reactive

7 2 **Reactivity with Common Materials:**
Reacts with oxidizing materials

7 3 **Stability During Transport:** May decomposite when heated under confinement

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

Aniline Products, Inc.
2 McLean Blvd
Paterson, N.J. 07509

American Hoechst Corp.
Chemical and Plastics Division
Somerville, N.J. 08876

Morse Martin Corp.
Southern Division Office
Charlotte, N.C. 28201

10 SHIPPING INFORMATION

10 1 **Grades or Purity:**
Technical and Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 444 3

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** [illegible]

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible]

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:** [illegible]

13 14 **Heat of Decomposition:** [illegible]

13 15 **Heat of Solution:** [illegible]

13 16 **Heat of Polymerization:** Not pertinent

[illegible] next page

NOTES

REVISED 1978

DNB — m-DINITROBENZENE

Common Synonyms

1,3-Dinitrobenzene
1,3-Dinitrobenzol
m-DNB

Solid | Yellow | Slight odor

Sinks in water

AVOID CONTACT WITH SOLID AND DUST
DO NOT SMOKE

Fire

Combustible
May explode if exposed to heat or flames

Exposure

VAPOR OR DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,3-Dinitrobenzene; 1,3-Dinitrobenzol; m-DNB; meta-Dinitrobenzene
3.2 **Coast Guard Compatibility Classification:** To be developed
3.3 **Chemical Formula:** $C_6H_4N_2O_4$
3.4 **IMCO/United Nations Numerical Designation:** 1597

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Yellow
4.3 **Odor:** Weak

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Use respiratory protection and protective clothing.
5.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Causes headache, dizziness, drowsiness and slight cyanosis. Vapor and dust are readily absorbed through skin and cause poisoning. Ingestion causes nausea, vomiting, abdominal pain, and collapse.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if not breathing, give artificial respiration, preferably mechanical assistance. EYES: flush with plenty of water. SKIN: wash with soap and water. INGESTION: induce vomiting by giving large quantities of water and repeating; call physician immediately.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} 42 mg/kg (rats)
5.7 **Late Toxicity:** May cause liver damage; carcinogen
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (Combustible solid)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water; protected foam
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** May explode
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Rating: Limit is 1 to 10 ppm; 96 hr TLm; fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Aldrich Chemical Co., Inc.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

2. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (Solid at 15°C)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poison Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 168
13.3 **Boiling Point at 1 atm:** 573°F, 301°C, 574°K
13.4 **Freezing Point:** 190°F, 88°C, 361°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.57 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** -1,070 Btu/lb, -595 cal/g, -24.9 x 10³ J/g
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 4)

NOTES

DNC — DINITROCRESOLS

Common Synonyms	Solid	Yellow
4,6-Dinitro-o-cresol 1,5-Dinitro-o-cresol 2,6-Dinitro-o-cresol	Sinks in water	

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire
Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause loss of consciousness SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning. Keep contaminant
Restrict access
Should be removed
Chemical and personal treatment

2. LABELS

No hazard label required by U.S. Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,6-Dinitro-o-cresol
4,6-Dinitro-o-cresol; 4,6-Dinitro-o-cresol

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula:** $C_7H_6N_2O_5$

3.4 **IMCO/United Nations Numerical Designation.** None

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Yellow

4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective clothing, rubber gloves

5.2 **Symptoms Following Exposure:** Very high fever, sweating, rapid pulse, and collapse following absorption in a fatal dose. Dinitrocresol: Inhalation of dust may cause same symptoms as ingestion. Ingestion: nausea, feeling of heat, weakness, yellow discoloration of skin, increased body metabolism, marked body weight loss, convulsions, coma and death. Contact with skin may cause irritation. Contact with eyes causes irritation and possible damage to eyes. Other toxic effects: None known. Note: Some authorities recommend that dinitrocresol workers have medical exams to determine personal susceptibility before they are assigned to this work. Suggested medical exams: none known.

5.3 **Treatment for Exposure:** INHALATION: apply artificial respiration if breathing has stopped and oxygen if breathing is difficult. INGESTION: induce vomiting (if victim is conscious and not convulsing) by giving two glasses of water and administering ipecac. Get medical attention. EYES: flush with plenty of water for at least 15 minutes, lifting upper and lower lids. SKIN: wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** 0.2 mg/m³

5.5 **Short-Term Inhalation Limits.** 1 mg/m³ for 30 min

5.6 **Toxicity by Ingestion:** Grade 4. LD$_{50}$: 30 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Water fog, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 96-hour LC$_{50}$ for aquatic organisms: 4.5 ppm (bluegill); 2.5 ppm (goldfish); 0.5 ppm (rainbow trout); 4-day median TL$_m$: 0.5 ppm (fresh water)

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

Sherwin-Williams Chemicals
P.O. Box 320
Cleveland, Ohio 44110

Pfaltz & Bauer, Inc.
375 Fairfield Ave.
Stamford, Conn. 06902

J.T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, 90-95%
Paste containing 85-90% water, pure

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:**
Not listed

*12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

*12.3 **NFPA Hazard Classifications:**
Oxidizer

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:**
Solid

13.2 **Molecular Weight:** 198

*13.3 **Boiling Point at 1 atm:** Not pertinent
(decomposes)

*13.4 **Freezing Point:** 176°C (349°F)
or 449 °K (Corrected) 450 °K

*13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

*13.7 **Specific Gravity:** 1.68 at 20°C (Crystals)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.**
Not pertinent

*13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

*13.12 **Latent Heat of Vaporization:**
Not pertinent

13.13 **Heat of Combustion:** -7050 Btu/lb
-3920 cal/g = -164 x 10^5 J/kg

*13.14 **Heat of Decomposition:** Data not available

13.15 **Heat of Solution:** Not pertinent.

*13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

5 HEALTH HAZARDS (Cont'd)

DNP	2,4-DINITROPHENOL

Common Synonyms
Alpha Dinitrophenol
1-Hydroxy-2,4-dinitrobenzene

Solid crystal | Yellow | Sweet metallic odor

Sinks in water

Fire

Combustible
May explode if subjected to heat or flame
POISONOUS GASES PRODUCED WHEN HEATED

Exposure

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED

SOLID
POISONOUS IF SWALLOWED

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Evacuate area
Keep unnecessary people away
Isolate hazard area and deny entry
Stay upwind
Keep out of low areas
Ventilate closed spaces before entering
Wear self-contained breathing apparatus and full protective clothing
Should be removed
Chemical and physical treatment

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Aldifen
Alpha-Dinitrophenol
Hexanitrodiphenylamine

3.2 **Coast Guard Compatibility Classification:**
Not applicable

3.3 **Chemical Formula:**
$HOC_6H_3(NO_2)_2$

3.4 **IMCO United Nations Numerical Designation:** 1599

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Yellow

4.3 **Odor:** Mildly sweet

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, Rubber gloves, Rubber boots, Rubber suit

5.2 **Symptoms Following Exposure:** Headache, dizziness, nausea, loss of weight, fever, profuse perspiration, yellow discoloration of skin, cataracts

5.3 **Treatment for Exposure:** Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Wash skin with soap and water. Induce vomiting. Call physician. Keep victim warm and quiet.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4 Poison. Minimum lethal dose unknown

5.7 **Late Toxicity:** Produces clouding of lens of eye (cataracts) in animals and humans; birth defects in chick embryos

5.8 **Vapor (Gas) Irritant Characteristics:** None known

5.9 **Liquid or Solid Irritant Characteristics:** Causes staining of the skin and first-degree burns on short exposure, may cause second-degree burns on long exposure

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide, foam

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Vapor is toxic

6.6 **Behavior in Fire:** Vapor density increases when heated under confinement

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Reacts with oxidizing materials and combustibles

7.3 **Stability During Transport:** May decompose when heated under confinement

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 500 ppm is the minimum dose for fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. American Mineral Products Inc.
29 McLean Blvd
Paterson, N.J. 07504

2. Mallinckrodt Chemical Works
Mallinckrodt Chemical Division
Charlotte, N.C. 28201

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid, Packing Group II

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 184

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** 234.1 to 235.1°C

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.68 at 20°C

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Literature References

NOTES

REVISED 1978

DTT — 2,4-DINITROTOLUENE

Common Synonyms

DNT
2,4-Dinitrotoluol
1-Methyl-2,4-Dinitrobenzene

Solid or heated liquid. Yellow to red solid or yellow liquid. Slight odor.

Liquid solidifies. Solid and liquid sink in water.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire.

Exposure

LIQUID OR SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes.
If swallowed will cause nausea, vomiting or loss of consciousness.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms.
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO/United Nations Numerical Designation.

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5. HEALTH HAZARDS

5 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion.
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics.
5.9 Liquid or Solid Irritant Characteristics.
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents.
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products.
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

*7.1 Reactivity with Water:
7.2 Reactivity with Common Materials.
*7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
*7.5 Polymerization:
*7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

*10.1 Grades or Purity:
*10.2 Storage Temperature:
*10.3 Inert Atmosphere:
*10.4 Venting:

11 HAZARD ASSESSMENT CODE

XXVII

12 HAZARD CLASSIFICATIONS

*12.1 Code of Federal Regulations:
*12.2 NAS Hazard Rating for Bulk Water Transportation:
*12.3 NFPA Hazard Classifications:

Category	Classification

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm.
*13.2 Molecular Weight:
*13.3 Boiling Point at 1 atm:
*13.4 Freezing Point:
*13.5 Critical Temperature:
*13.6 Critical Pressure:
*13.7 Specific Gravity:
*13.8 Liquid Surface Tension.
*13.9 Liquid-Water Interfacial Tension.
*13.10 Vapor (Gas) Specific Gravity
*13.11 Ratio of Specific Heats of Vapor (Gas)
*13.12 Latent Heat of Vaporization:
*13.13 Heat of Combustion.
*13.14 Heat of Decomposition.
*13.15 Heat of Solution:
*13.16 Heat of Polymerization:

NOTES

DOA — DIOCTYL ADIPATE

Common Synonyms
Adipic acid bis(2-ethylhexyl) ester
Di(2-ethylhexyl) adipate

Oily liquid | Colorless | Odorless

Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with foam, carbon dioxide, dry chemical or water spray
Water may be ineffective on fire

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to eyes
Wash skin with soap and water
IN CASE OF CONTACT IMMEDIATELY FLUSH EYES with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Mechanical containment
Chemical and physical treatment

2 LABELS

Not specified by regulations
Check Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
Adipic acid bis(2-ethylhexyl) ester
Adimol 2EH
Di(2-ethylhexyl) adipate
DOA

3.2 **Coast Guard Compatibility Classification**
Letter

3.3 **Chemical Formula**
$C_6H_{10}O_4(C_8H_{17})_2$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Colorless

4.3 **Odor** Mild characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** None required

5.2 **Symptoms Following Exposure** Eye irritation, narcosis or oil injury in industrial handling

5.3 **Treatment for Exposure** CONTACT WITH EYES AND EYES wipe off and wash skin with soap and water. Treat like lubricating oil. Flush eyes with water. Remove to fresh air.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5.5 **Short-Term Inhalation Limits** Not pertinent

5.6 **Toxicity by Ingestion** Grade 1 LD$_{50}$ > 5 g/kg

5.7 **Late Toxicity** None known

5.8 **Vapor (Gas) Irritant Characteristics** Vapor or mist may irritate the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics** Moderate hazard. If spilled on clothing and allowed to remain may cause scarring and adherence of the skin

5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point.** 390°F OC

6.2 **Flammable Limits in Air** Data not available

6.3 **Fire Extinguishing Agents** Data not available

6.4 **Fire Extinguishing Agents Not to be Used** Data not available

6.5 **Special Hazards of Combustion Products** None

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
Plastics Division
Morristown, N.J. 07960
2. Diamond Shamrock Corp
Nopco Chemicals Division
Morristown, N.J. 07960
3. W.R. Grace & Co
Hatco Chemical Division
Fords, N.J. 08863

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.5%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

NFU

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 371

13.3 **Boiling Point at 1 atm** Very high

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity** 0.928 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
(est.) 28 dynes/cm = 0.028 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
(est.) 30 dynes/cm = 0.03 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization.**
Not pertinent

13.13 **Heat of Combustion** -15,433 Btu/lb
= -8580 cal/g = -359 × 10³ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5A

NOTES

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DOP — DIOCTYL PHTHALATE

Common Synonyms
Phthalic acid bis(2-ethylhexyl)ester)
DOP
Bis(2-ethylhexyl)phthalate
Di(2-ethylhexyl)phthalate
Octoil

Oily liquid | Colorless | Slight odor

Floats on water

Fire

Combustible

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical or physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
Bis(2-ethylhexyl)phthalate
Di-2-ethylhexylphthalate
DOP
Octoil
Phthalic acid bis(2-ethylhexyl)ester

3.2 **Coast Guard Compatibility Classification**
Later

(Continued on page 4)

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless
4.3 **Odor** Very slight characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Not required
5.2 **Symptoms Following Exposure** Produces mild effects in test animals. Human experience indicates irritation upon high exposure
5.3 **Treatment for Exposure** Remove contaminated clothes. Wash skin with soap and water. Flush eyes with water
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion** Oral rat LD$_{50}$ 30 g/kg
5.7 **Late Toxicity** Not established
5.8 **Vapor (Gas) Irritant Characteristics** None reported in the experiments
5.9 **Liquid or Solid Irritant Characteristics** No appreciable hazard. Practically nonirritating
5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** 420 F O C
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents** Dry powder, carbon dioxide, foam
6.4 **Fire Extinguishing Agents Not to be Used** Water or heavy stream
6.5 **Special Hazards of Combustion Products** None
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature** Data not available
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction
7.2 **Reactivity with Common Materials** No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agent for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
Plastics Division
Morristown, NJ 07960
2. W R Grace & Co
Hatco Chemical Division
Fords, NJ 08863
3. Monsanto Corp
Monsanto Industrial Chemicals Co
800 N Lindbergh Blvd
St Louis, Mo 63166

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Data not available
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

AFUAY

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 390.6
13.3 **Boiling Point at 1 atm**
727 F = 385 C = 658 K
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity** 0.981 at 25 C (gas=1)
13.8 **Liquid Surface Tension**
(calculated) dynes/cm = 0.015 N/m at 20 C
13.9 **Liquid-Water Interfacial Tension**
(calculated) dynes/cm = 0.03 N/m at 24 C
13.10 **Vapor (Gas) Specific Gravity**
Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent
13.12 **Latent Heat of Vaporization**
Not pertinent
13.13 **Heat of Combustion** -15,130 Btu/lb
= -8410 cal/g = -352 x 10^3 J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

(Continued on page 4)

3 CHEMICAL DESIGNATIONS (Cont'd)

3.3 **Chemical Formula**
$C_6H_4(COOCH_2CH(C_2H_5)C_4H_9)_2$ or $C_{24}H_{38}O_4$
3.4 **IMCO United Nations Numerical Designation** Not listed

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DSS — DIOCTYL SODIUM SULFOSUCCINATE

Common Synonyms
Bis(2-ethylhexyl) sodium sulfosuccinate
Aerosol surfactant
Aerowet D65
Di(2-ethylhexyl) sulfosuccinate sodium salt
Sodium dioctyl sulfosuccinate

Waxy solid or waters solution | Colorless to white | Odorless

Sinks and mixes slowly with water

Fire

Not flammable

Exposure

LIQUID OR SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Aerosol Surfactant
AY-100 DSS Base - Di(2-ethylhexyl) sodium sulfosuccinate - Di(2-ethylhexyl) sulfosuccinate sodium salt - Sodium dioctyl sulfosuccinate
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula.** $C_{20}H_{37}OOCCH(SO_3Na)CH_2OOCC_8H_{17}$
3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Waxy solid or water solution
4 2 **Color** Colorless - off white
4 3 **Odor.** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Chemical goggles rubber gloves for respirator
5 2 **Symptoms Following Exposure** Liquid is strong irritant to eyes and mucous membranes, skin by removing natural oils. Ingestion causes diarrhea and intestinal bleeding
5 3 **Treatment for Exposure** EYES irrigate with copious volumes of water for at least 15 minutes and physician SKIN wash off with water INGESTION drink large amounts of water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion** Grade 2 oral LD_{50} = 1900 mg/kg (rat)
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire.** Causes foaming and spreading of water. Assists in putting out fires by water
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Proctor Chemical Company Inc
P O Box 499
Salisbury N C 28144
2 American Cyanamid Co
Industrial Chemicals and Plastics Division
Wayne N J 07470
3 Ciba Geigy Corporation
Dyes and Specialty Chemicals Division
Bayonne N J 07002

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Several grades contain inert diluents concentration of compound may be as low as 50% by weight Many are water solutions
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

HSS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid or liquid
13 2 **Molecular Weight** 444
13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)
13 4 **Freezing Point** (solid forms) 311 K = 38°C = 428°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity** 1.1 at 20°C (solid or liquid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on page 1 and 5

NOTES

DOX	# 1,4-DIOXANE

Common Synonyms			
Dioxane p-Dioxane	Liquid	Colorless	Slight alcohol odor

Sinks and mixes with water. Flammable, irritating vapor is produced. Freezing point is 53° F.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus and rubber protective clothing (including gloves).
Shut off ignition sources; no flares, smoking or flames.
Stop discharge if safe.
Stay upwind and keep out of low areas; ventilate closed spaces before entering.
Isolate and remove leaking container.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus and rubber protective clothing (including gloves).
Extinguish with dry chemical, CO2, water spray or foam.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.
May cause shock.
If breathing has stopped, give artificial respiration.
Provide fresh air.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing, shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (two glasses at most). Induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting or give anything by mouth.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-2)

Isolate warning, high flammability.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diethylene oxide; Dioxan; p-Dioxane
3.2 **Coast Guard Compatibility Classification:** Group 1
3.3 **Chemical Formula.** $C_4H_8O_2$ or $OCH_2CH_2OCH_2CH_2$
3.4 **IMCO United Nations Numerical Designation.** 3.2/1165

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild somewhat aromatic ether; faint alcohol ethereal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protective clothing, including gloves. Self-contained breathing apparatus.
5.2 **Symptoms Following Exposure:** No significant acute hazard. Liquid irritating to eyes and skin. Prolonged or repeated exposure may cause skin burns and dermatitis. Vapor irritating to eyes, nose and throat. Headache, dizziness, nausea, vomiting, drowsiness, unconsciousness. Effects may be delayed. Material is readily absorbed through intact skin.
5.3 **Treatment for Exposure:** INHALATION: If victim is conscious, give oxygen. Keep victim warm and quiet. Get medical attention. If victim is not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. INGESTION: Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention. SKIN AND EYES: Flush with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** 100 ppm for 60 min
5.6 **Toxicity by Ingestion:** Grade 3. LD_{50} (oral, rat) = 4.2 g/kg
5.7 **Late Toxicity:** Causes cancer in rats
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes slight smarting of eyes and respiratory tract (nose and throat) on prolonged exposure. Data inadequate for rating.
5.9 **Liquid or Solid Irritant Characteristics:** Moderate irritant to eyes, based on tests with rabbits. Prolonged contact with skin may cause dermatitis.
5.10 **Odor Threshold:** 620 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point:** 54°F C.C. 74°F O.C.
6.2 **Flammable Limits in Air:** 2.0% - 22.0% by vol.
6.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, dry chemical.
6.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.
6.5 **Special Hazards of Combustion Products:** Toxic vapors are released when heated.
6.6 **Behavior in Fire:** Vapor may travel to source of ignition and flash back.
6.7 **Ignition Temperature:** 356°F
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** Data not available.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** (5 days, 20°C) 1.0 lb/lb
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. Ethyl Corp.
Organic Chemical Division
12418 Scenic Highway
Baton Rouge, La. 70821
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Data not available
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrestor or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-1)

NPO

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Damage	1
Liquid Soil Damage	1
Poisons	3
Water Pollution	
Human Toxicity	1
Marine Toxicity	2
Vapor Effect	3
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 88.11
13.3 **Boiling Point at 1 atm:** 214.4°F = 101.3°C = 374.5°K
13.4 **Freezing Point:** 53°F = 11.8°C = 285°K
13.5 **Critical Temperature:** 497°F = 314°C = 587°K
13.6 **Critical Pressure:** 755 psia = 51.4 atm = 5.21 MN/m²
13.7 **Specific Gravity:** 1.034 at 20°C (liquid)
13.8 **Liquid Surface Tension:** No pertinent data found
13.9 **Liquid-Water Interfacial Tension:** No pertinent data found
13.10 **Vapor (Gas) Specific Gravity:** No pertinent data found
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.01
13.12 **Latent Heat of Vaporization:** 175 Btu/lb = 97.2 cal/g = 4.07 × 10⁸ J/kg
13.13 **Heat of Combustion:** -14,400 Btu/lb = -7,980 cal/g = -334 × 10⁸ J/kg
13.14 **Heat of Decomposition:** No pertinent data found
13.15 **Heat of Solution:** 1.0 lb/lb = 5.0 cal/g = 210 × 10⁸ J/kg
13.16 **Heat of Polymerization:** No pertinent data found

NOTES

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DPN DIPENTENE

Common Synonyms			
p-Mentha-1,8-diene Limonene Terpinene delta-1,8-Terpodiene Phellandrene	Liquid Floats on water	Colorless to light yellow	Pleasant lemon like odor

Stop discharge if possible. Keep people away.
Notify [illegible]
Dike [illegible]
Notify [illegible]

Fire

Combustible
Containers may explode in fire
Extinguish with [illegible]
Water may be ineffective
Cool exposed containers with [illegible]

Exposure

[illegible]

VAPOR

Irritating to eyes, nose and throat
May [illegible]
[illegible]

LIQUID

Irritating to skin and eyes
Harmful if swallowed
Wash skin with soap and water
Flush eyes with water
IF INVOLVED [illegible] ASSIST VICTIM
IF SWALLOWED [illegible] ASSIST VICTIM [illegible] trucks

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify [illegible]
Notify [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Coast Guard
Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** 1-menthene para-Mentha-1,8-diene, Phellandrene, Terpinene, delta-1,8-Terpodiene

3.2 **Coast Guard Compatibility Classification** Olefins (11)

3.3 **Chemical Formula** $C_{10}H_{16}$

3.4 **IMCO/United Nations Numerical Designation** 33 2052

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Colorless to pale yellow

4.3 **Odor** Pleasant piney lemonlike

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Splash-proof chemical goggles, safety glasses, face shield, self-contained breathing apparatus for high vapor concentrations

5.2 **Symptoms Following Exposure** Liquid irritates eyes, prolonged contact will defat skin, causes irritation. Ingestion causes irritation of gastrointestinal tract

5.3 **Treatment for Exposure** INHALATION: remove victim to fresh air, if not breathing give artificial respiration, if breathing is difficult give oxygen, call physician. EYES: Flush with water for 15 minutes, call physician. SKIN: wash with soap and water. INGESTION: induce vomiting, call physician

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Grade 2 oral LD[illegible] [illegible] grams/kg

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Vapor concentrations slightly irritating to eyes, nose and throat present in high concentrations. The effects are temporary

5.9 **Liquid or Solid Irritant Characteristics** Minimally hazardous. Repeated or prolonged contact may cause irritation to skin and eyes

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 115°F C.C.

6.2 **Flammable Limits in Air** 0.7% to 6.1%

6.3 **Fire Extinguishing Agents** For small fires, dry chemical, carbon dioxide, water spray or fog. For large fires, water spray, fog or foam. Move containers from fire area if possible. Dilute vapors to below explosive levels with water spray. Avoid aiming straight streams directly into liquid pools.

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Containers may explode

6.7 **Ignition Temperature** 458°F

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate** 3.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Hercules Incorporated
Organics Department
Wilmington, Del. 19899

2. Reichhold Chemicals Inc.
Newport Division
P.O. Box 1582
Pensacola, Fla. 32596

3. SCM Corporation
Glidden-Durkee Division
P.O. Box 86
Jacksonville, Fla. 32201

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Several technical grades all having same general purities

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Open-flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

AFH

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poison	0
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 136.2

13.3 **Boiling Point at 1 atm** 349°F = 176.7°C = 449.8°K

13.4 **Freezing Point** -70°F = -56.7°C = 216.5°K

13.5 **Critical Temperature** No pertinent

13.6 **Critical Pressure** No pertinent

13.7 **Specific Gravity** 0.84 at 20°C (liquid)

13.8 **Liquid Surface Tension** (est.) 26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** 45 dynes/cm = 0.045 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity** 4.9

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** 131 Btu/lb = 72 cal/g = 3.2 × 10⁵ J/kg

13.13 **Heat of Combustion** -19,530 Btu/lb = -10,850 cal/g = -4.54 × 10⁷ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(continued on page [illegible])

NOTES

DAM — DIPHENYLAMINE

Common Synonyms	Solid or liquid	Light tan to brown	Pleasant odor
Anilinobenzene N-Phenylaniline	Sinks in water		

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
Harmful if inhaled

LIQUID OR SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning. Water contaminated
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Anilinobenzene, N-Phenylaniline
3.2 **Coast Guard Compatibility Classification** Data not available
3.3 **Chemical Formula.** $(C_6H_5)_2NH$
3.4 **IMCO/United Nations Numerical Designation** Data not available

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid or liquid
4.2 **Color** Very pale tan, amber, or brown
4.3 **Odor** Characteristic, pleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Respirator, safety goggles, face shield, rubber gloves
5.2 **Symptoms Following Exposure** Inhalation may irritate mucous membranes. On exposure, including ingestion of solid, workers complained of nausea, headache, hypertension, and bladder trouble. Contact with dust irritates eyes.
5.3 **Treatment for Exposure:** INHALATION move victim to fresh air. INGESTION get medical attention; observe for methemoglobinemia. EYES flush with plenty of water and see physician. SKIN wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 10 mg/m³
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion** Grade 2; oral LD_{50} = 1,000 mg/kg (rat)
5.7 **Late Toxicity** Causes birth defects in rats (polycystic kidneys)
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** (liquid) 307°F OC
6.2 **Flammable Limits in Air.** Not pertinent
6.3 **Fire Extinguishing Agents** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products** Fumes, oxides of nitrogen may form in fire
6.6 **Behavior in Fire** Dust may be explosive if mixed with air in critical proportions and in the presence of a source of ignition
6.7 **Ignition Temperature** 1,175°F
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction
7.2 **Reactivity with Common Materials**
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Uniroyal Chemical
Div. of Uniroyal Inc.
Elm Street
Naugatuck, Conn. 06770
2. American Cyanamid Co.
Intermediates Dept.
Bound Brook, N.J. 08805
3. Eastman Kodak Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades of Purity** Technical sometimes shipped as liquid
10.2 **Storage Temperature** Ambient for solidified material
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid or liquid
13.2 **Molecular Weight:** 169.2
13.3 **Boiling Point at 1 atm:** 576°F = 302°C = 575°K
13.4 **Freezing Point:** 127°F = 53°C = 326°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity:** 1.16 at 71°C (liquid)
13.8 **Liquid Surface Tension** 38.3 dynes/cm at 71°C (160°F)
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** (-) 16,480 Btu/lb = -9,160 cal/g = -38.3 × 10⁶ J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

DPD — DIPHENYLDICHLOROSILANE

Common Synonyms

Dichlorodiphenylsilane
Dichlorodiphenylsilicane
Diphenylsilicon dichloride

Liquid Colorless Sharp irritating odor

Reacts with water. Irritating vapor is produced.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Issue warning. Corrosive water contaminant.
Restrict access.
Dispose and flush with care.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Dichlorodiphenylsilane; Dichlorodiphenylsilicane; Diphenylsilicon dichloride

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula** $(C_6H_5)_2SiCl_2$

3.4 **IMCO/United Nations Numerical Designation** No. 1769

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp hydrochloric acid like pungency

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Avoid eye, skin exposure to liquid, vapor, mist. Use chemical worker's goggles; wear protective gloves, boots, aprons; use respirator when indicated.

5.2 **Symptoms Following Exposure** Irritation of eyes, skin, mucous membranes. Liquid causes severe burns. Vapor, mist or fumes cause coughing, choking, sore throat.

5.3 **Treatment for Exposure** INHALATION: Remove to fresh air. Apply artificial respiration if not breathing. Call physician if needed. EYES: Flush with water for at least 15 minutes. Call physician immediately. SKIN: Remove contaminated clothing. Wash affected areas with soap and water. INGESTION: Do not induce vomiting. Call physician immediately. Have victim drink water (two glasses at most). Never give anything by mouth to an unconscious person.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Grade 4 LD50 (rat) 200 mg/kg

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Vapors are highly irritating to eyes, skin, and mucous membranes. Warning properties adequate. Do not remain in area.

5.9 **Liquid or Solid Irritant Characteristics** Severely irritating to eyes, skin, and mucous membranes. Causes burns readily. Wash skin with soap and water. Flush eyes with water.

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 288°F O.C.

6.2 **Flammable Limits in Air** Data not available

6.3 **Fire Extinguishing Agents** Dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water and foam

6.5 **Special Hazards of Combustion Products** Hydrochloric acid; dense smoke when involved in fire

6.6 **Behavior in Fire** Difficult to ignite. Will not be recognized as present. Contact with flame or application of direct fire will produce irritating hydrochloric acid fumes.

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Reacts with water to generate hydrogen chloride (hydrochloric acid).

7.2 **Reactivity with Common Materials.** Reacts with surface moisture to generate hydrogen chloride which is corrosive to common metals.

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Flush with water. Rinse with sodium bicarbonate or dilute solution.

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Dow Corning Corporation
P.O. Box 592
Midland, MI 48640

2. PCR Inc.
P.O. Box 1466
Gainesville, Fla. 32602

3. Stauffer Corp.
Alfa Products
P.O. Box 139
Beverly, Mass. 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 96%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

YO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Toxic Irritant	3
Liquid or Solid Irritant	3
Poison	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	1
Water	2
Self	0

12.3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 253

13.3 **Boiling Point at 1 atm** 572°F = 300°C = 573°K

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.22 at 25°C (liquid)

13.8 **Liquid Surface Tension:** Data not available
25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** 150 Btu/lb = 80 cal/gm = 3.35 × 10⁵ J/kg

13.13 **Heat of Combustion** Data not available
= −6,200 kcal/g = −26,000 J/g

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Data not available

13.16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

DPE — DIPHENYL ETHER

Common Synonyms			
Phenyl ether Diphenyl oxide Phenoxybenzene	Liquid	Colorless	Mild peasant odor
	May float or sink in water. Freezing point is 81° F		

Fire	Combustible [illegible]
Exposure	[illegible] LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Phenyl ether
Diphenyl oxide
Phenoxybenzene

3 2 **Coast Guard Compatibility Classification.** not applicable

3 3 **Chemical Formula:** $C_6H_5OC_6H_5$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Weak geranium

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation may cause nausea because of appreciable risk. Contact of liquid with eyes causes mild irritation. Prolonged exposure of skin to liquid causes reddening and irritation. Ingestion produces nausea.

5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: induce vomiting and get medical attention.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** ppm

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 2; oral LD_{50} = [illegible] mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** 0.[illegible] ppm

6 FIRE HAZARDS

6 1 **Flash Point** 250 F C.C.

6 2 **Flammable Limits in Air:** [illegible]

6 3 **Fire Extinguishing Agents** Dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** 1165 F

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** [illegible] mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640

2. Givaudan Corp.
100 Delawanna Ave.
Clifton, N.J. 07014

3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure grade
Technical grade, Perfumer's grade

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

AIEAN

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight** 170.2

13 3 **Boiling Point at 1 atm** 496.1 F = 258° C = 531 K

13 4 **Freezing Point** 81.1 F = 27° C = 300 K

13 5 **Critical Temperature** 721 F = 493 C = 767 K

13 6 **Critical Pressure.** 470 psia = 32 atm = 3.240 MN/m²

13 7 **Specific Gravity:** 1.07 at 25° C (liquid)

13 8 **Liquid Surface Tension.** 40.05 dynes/cm = 0.040 N/m at 20° C

13 9 **Liquid-Water Interfacial Tension.** 52.1 dynes/cm = 0.036 N/m at 20° C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** 0.[illegible] Btu/lb = 72 cal/g = 0.3 MJ/kg

13 13 **Heat of Combustion** [illegible] Btu/lb = 8620 cal/g = 36 MJ/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

DPM — DIPHENYLMETHANE DIISOCYANATE

Common Synonyms
MDI
Diphenylmethane-4,4'-diisocyanate

Solid — White to light yellow

Sinks in water

Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible

Wear goggles and self-contained breathing apparatus.
Extinguish with foam, dry chemical or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

SOLID
Irritating to skin and eyes.

Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearest water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-448-4

Evacuate area of unprotected personnel.
Shut off source.
Clean up and dispose of properly.

2. LABELS

No hazard specific label.
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Diphenylmethane-4,4'-diisocyanate; 4,4'-Methylenebis(phenyl isocyanate); MDI; Methylenebis(4-phenylisocyanate); MDI-50; Methylene diphenyl diisocyanate; Isocyanic acid, methylenedi-4,1-phenylene ester

3.2 **Coast Guard Compatibility Classification** Isocyanate

3.3 **Chemical Formula** $C_{15}H_{10}N_2O_2$

3.4 **IMCO United Nations Numerical Designation.** Not assigned

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color.** Colorless to light yellow

4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Mask with respirator for organic vapors (NIOSH/MSHA approved) or self-contained breathing apparatus. Rubber boots and gloves. Rubber apron. Wear chemical safety goggles or face shield. Eye wash fountain should be provided in work area.

5.2 **Symptoms Following Exposure:** Breathlessness. Irritation of eyes, skin, nose, throat and respiratory tract.

5.3 **Treatment for Exposure:** INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. SKIN CONTACT: Wash with soap and water. Remove contaminated clothing and shoes. EYE CONTACT: Flush with plenty of water for at least 15 minutes. Get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.02 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Severe irritation of eyes, nose, throat and respiratory tract. Lacrimation. Coughing. Pulmonary edema.

5.9 **Liquid or Solid Irritant Characteristics** Moderate irritation. Primary irritation to skin with prolonged contact. Slight conjunctivitis.

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 425°F O.C.

6.2 **Flammable Limits in Air** Not determined

6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical.

6.4 **Fire Extinguishing Agents Not to be Used** Not determined

6.5 **Special Hazards of Combustion Products.** Toxic vapors are generated when heated.

6.6 **Behavior in Fire** Melts and burns

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard** Not determined

6.9 **Burning Rate** Not determined

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:**
Reacts slowly
Reaction is endothermic

7.2 **Reactivity with Common Materials:**
Data not available

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not determined

7.5 **Polymerization:** May occur slowly
Heat hazardous

7.6 **Inhibitor of Polymerization.**
Not determined

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD).**
Data not available

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

Bayer Corp.
Mobay Chemical Co.
Pennsylvania Ave.
Pittsburgh, PA 15205

E. I. du Pont de Nemours & Co. Inc.
Elastomer Chemicals Dept.
Wilmington, Delaware

Upjohn Co.
Polymer Chemicals Division
Kalamazoo, MI

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Solid grades: 98% min. Liquid grade may contain 5% o-dichlorobenzene

10.2 **Storage Temperature:** 40°F

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-448

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
I	
Health	
Vapor Exposure	3
Liquid Contact	3
Poison	4
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aquatic Effects	
Reactivity	
Org. Chemicals	
Water	0
Self-Reactivity	

12.3 **NFPA Hazard Classifications.**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight** 250.3

13.3 **Boiling Point at 1 atm**
392°F (at 0.2 mm Hg) (200°C at 2 mm Hg)

13.4 **Freezing Point** 102°F (39°C)

13.5 **Critical Temperature** Not determined

13.6 **Critical Pressure** Not determined

13.7 **Specific Gravity** 1.20 (25°C/4°C)

13.8 **Liquid Surface Tension** Not determined

13.9 **Liquid-Water Interfacial Tension**
Not determined

13.10 **Vapor (Gas) Specific Gravity**
Not determined

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not determined

13.12 **Latent Heat of Vaporization**
Not determined

13.13 **Heat of Combustion.** Not determined

13.14 **Heat of Decomposition** Not determined

13.15 **Heat of Solution** Not determined

13.16 **Heat of Polymerization** Not determined

NOTES

REVISED 1978

DNA	Di-n-PROPYLAMINE

Common Synonyms			
N-propyl-1-propanamine	Liquid	Colorless	Strong ammonia like odor
	Floats and mixes with water		

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness, coughing or difficult breathing

LIQUID
Will burn eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Isolate warning water for ammonia or contaminant; high flammability
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** N-n-Propylpropanamine
3.2 **Coast Guard Compatibility Classification** Not listed
3.3 **Chemical Formula** $(C_3H_7)_2NH$; Not
3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless
4.3 **Odor** Strong ammoniacal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Self-contained breathing apparatus; butyl rubber gloves; butyl rubber apron; face shield
5.2 **Symptoms Following Exposure** Inhalation causes severe cough and chest pain; edema of the passages can cause lung edema; may also cause headache, nausea and anorexia. Ingestion causes irritation and burning in mouth and stomach. Contact causes severe irritation and edema of the tissues. Contact also causes severe irritation
5.3 **Treatment for Exposure** INHALATION: remove victim; if breathing has stopped, give artificial respiration; if breathing is difficult, give oxygen; call a physician. INGESTION: give large amounts of water; get medical attention. EYES: flush with water for 15 minutes; get medical attention. SKIN: flush with water for 15 minutes
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion** Grade 3; Oral LD_{50} [illegible] mg/kg rats; moderate acute toxicity
5.7 **Late Toxicity** Causes degenerative changes in liver and kidneys in rats and rabbits
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 35°F TOC
6.2 **Flammable Limits in Air** Data not available
6.3 **Fire Extinguishing Agents.** Foam, CO2, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard.** Data not available
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction
7.2 **Reactivity with Common Materials.** May react with some forms of plastic
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** No response 24 hr sick, observe for one week
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. A-Peako Oil and Chemicals Inc.
   [illegible] N. Highway 90
   Pace, Fla. 32502
2. Penwalt Corporation
   3 Penn Parkway
   Philadelphia, Pa. 19102
3. Eastman Organic Chemicals
   Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 95% Pure 98+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Open [illegible]

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

AFQT1

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

12 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 101.19
13.3 **Boiling Point at 1 atm:** 226°F = 108°C = 381°K
13.4 **Freezing Point:** -147°F = -83°C = 190°K
13.5 **Critical Temperature:** [illegible]°F = 365°C = 638°K
13.6 **Critical Pressure:** 490 psia = 33 atm = 3.3 MN/m²
13.7 **Specific Gravity:** 0.736 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 0.0022 dyne/cm = 0.00022 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.5
13.11 **Ratio of Specific Heats of Vapor (Gas)**
13.12 **Latent Heat of Vaporization** 143 Btu/lb = 79.4 cal/g = 333 x 10³ J/kg
13.13 **Heat of Combustion.** -18,750 Btu/lb = -10,420 cal/g = -436 x 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

DPG	DIPROPYLENE GLYCOL

Common Synonyms

Thick liquid Colorless Odorless

Sinks and mixes with water

Fire

Combustible

Exposure

LIQUID
Irritating to eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification
Group
3.3 Chemical Formula
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped).
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: EYES
SKIN & INGESTION
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits
5.6 Toxicity by Ingestion
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics
5.9 Liquid or Solid Irritant Characteristics
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents.
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate: 2.0 mm/min

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport.
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity
Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD)
Data not available
8.4 Food Chain Concentration Potential
None

9 SELECTED MANUFACTURERS

Celanese Corp.
Celanese Chemical Division
245 Park Ave.
New York, N.Y. 10017

Dow Chemical Co.
Midland, Michigan

Union Carbide Corp.
Chemicals & Plastics
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

Hazard Assessment Handbook, 2nd Edition
XPQ

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating
Health	
Flammability	
Reactivity	
Oxidizer	
Water	

12.3 NFPA Hazard Classifications

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm:
*13.2 Molecular Weight.
*13.3 Boiling Point at 1 atm.
*13.4 Freezing Point.
*13.5 Critical Temperature:
*13.6 Critical Pressure:
*13.7 Specific Gravity:
*13.8 Liquid Surface Tension:
*13.9 Liquid-Water Interfacial Tension.
*13.10 Vapor (Gas) Specific Gravity:
*13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization
*13.13 Heat of Combustion. 11,650 Btu/lb
= 6470 cal/g = 271 × 10^3 J/kg
*13.14 Heat of Decomposition
13.15 Heat of Solution
13.16 Heat of Polymerization

NOTES

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DFF DISTILLATES: FLASHED FEED STOCKS

Common Synonyms

Liquid Colorless Gasoline-like odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

Flammable.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.

LIQUIDS
Irritating to eyes.
Harmful if swallowed.

DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure: INHALATION. ASPIRATION. INGESTION.
5.3 Treatment for Exposure: INHALATION. ASPIRATION. INGESTION. SKIN.
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Flammable liquid
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	
Health	
Vapor Toxicity	
Liquid Toxicity	
Flammability	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Mammalian Toxicity	
Reactivity	
Other Chemicals	
Water	
Self Reaction	

12.3 NFPA Hazard Classifications:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

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DSR	DISTILLATES: STRAIGHT RUN

Common Synonyms
Straight run gasoline

Watery liquid Colorless Gasoline-like odor

Floats on water. Flammable. Irritating vapor is produced.

[illegible]

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
[illegible]

Exposure

CALL FOR MEDICAL AID.
VAPOR
Irritating to eyes, nose and throat.
[illegible]
LIQUIDS
Irritating to eyes.
Harmful if swallowed.
[illegible]
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

[illegible]

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula: [illegible]
3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]
4.2 Color: [illegible]
4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: INHALATION [illegible] ASPIRATION [illegible] INGESTION [illegible]
5.3 Treatment of Exposure: [illegible] INHALATION [illegible] ASPIRATION [illegible] INGESTION [illegible] SKIN [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: [illegible]
5.6 Toxicity by Ingestion: [illegible]
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: [illegible]
6.4 Fire Extinguishing Agents Not to be Used: [illegible]
6.5 Special Hazards of Combustion Products: [illegible]
6.6 Behavior in Fire: [illegible]
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: [illegible]
6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]
7.2 Reactivity with Common Materials: [illegible]
7.3 Stability During Transport: [illegible]
7.4 Neutralizing Agents for Acids and Caustics: [illegible]
7.5 Polymerization: [illegible]
*7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]
8.2 Waterfowl Toxicity: [illegible]
8.3 Biological Oxygen Demand (BOD): [illegible]
8.4 Food Chain Concentration Potential: [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

*10 Grades or Purity: [illegible]
*10.2 Storage Temperature: [illegible]
*10.3 Inert Atmosphere: [illegible]
*10.4 Venting: [illegible]

11 HAZARD ASSESSMENT CODE

[illegible]

12 HAZARD CLASSIFICATIONS

*12.1 Code of Federal Regulations: Flammable liquid
12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating
[illegible]	

*12.3 NFPA Hazard Classifications: [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm: [illegible]
*13.2 Molecular Weight: [illegible]
*13.3 Boiling Point at 1 atm: [illegible]
13.4 Freezing Point: [illegible]
*13.5 Critical Temperature: [illegible]
*13.6 Critical Pressure: [illegible]
*13.7 Specific Gravity: [illegible]
*13.8 Liquid Surface Tension: [illegible]
13.9 Liquid-Water Interfacial Tension: [illegible]
13.10 Vapor (Gas) Specific Gravity: [illegible]
13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: [illegible]
13.15 Heat of Solution: [illegible]
13.16 Heat of Polymerization: [illegible]

NOTES

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DDN	DODECANOL

Common Synonyms
Lauryl alcohol
Dodecyl alcohol

Thick liquid | Colorless | Sweet odor

Floats on water. Freezing point is 75° F

Fire

Combustible

Exposure

LIQUID
Irritating to skin
Will burn eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
Data not available
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
Data not available
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

XII

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

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DOD

DODECENE

Common Synonyms
Propylene tetramer

Watery liquid | Colorless | Pleasant odor

Floats on water

Super Fischer Tropsch
Gulf Oil Chemicals Co
Kerr-McGee Chemical Corp
Union Carbide Corp
Vista Chemical Co

Fire

Combustible.

Use water spray, fog, foam, dry chemical or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Wear goggles or face shield and rubber gloves
Wash contaminated clothing before reuse
IN CASE OF CONTACT WITH EYES: Flush with plenty of water
IN CASE OF SWALLOWING: If victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** Dodecene (non linear)
Propylene tetramer
Tetrapropylene

3 2 **Coast Guard Compatibility Classification** Olefin

3 3 **Chemical Formula:** $C_{12}H_{24}$

3 4 **IMCO United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves; no respiratory protection needed if ventilation is adequate

5 2 **Symptoms Following Exposure:** No inhalation hazard expected. Aspiration hazard if ingested. Minor skin and eye irritation

5 3 **Treatment for Exposure** INHALATION: Remove victim to fresh air. INGESTION: do NOT induce vomiting. Do NOT lavage. Give vegetable oil and demulcents; call physician. EYE CONTACT: flush with water for 15 min. SKIN CONTACT: wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 0 LD$_{50}$ above 5 g/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Slight smarting of eyes and respiratory system at high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 120°F C.C. 134°F O.C.

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents:** Water fog, foam, carbon dioxide, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 400°F (est.)

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield Co
ARCO Chemical Division
260 S. Broad St
Philadelphia, Pa. 19101

2 Continental Oil Co
Conoco Chemicals Division
Park 80 Plaza East
Saddle Brook, N.J. 07662

3 Sun Oil Co
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98% - 99+% olefin

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X U U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

Continued on page 5 and 6

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight** 168.31

13 3 **Boiling Point at 1 atm:** 365° - 385°F = 185° - 196°C = 458 - 469 K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.77 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 23.0 dynes/cm = 0.0230 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** -19,100 Btu/lb = -10,600 cal/g = -444 × 10^3 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

NOTES

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DDC	# 1-DODECENE

Common Synonyms			
alpha-Dodecylene	Water: liquid	Colorless	Mild, pleasant odor
	Floats on water		

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with foam, dry chemical or carbon dioxide

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Adecene 12
alpha Dodecylene

3 2 **Coast Guard Compatibility Classification.** Olefin

3 3 **Chemical Formula.** $CH_3(CH_2)_8CH{=}CH_2$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild, pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Protective gloves, goggles or face shield

5 2 **Symptoms Following Exposure.** No inhalation hazard expected. Aspiration hazard if ingested. Minor skin and eye irritation

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting. Do NOT lavage. Give vegetable oil and demulcent, call physician. EYE CONTACT: flush with water for 15 min. SKIN CONTACT: wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Slight smarting of eyes and respiratory system at high concentration. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 174°F (approx.)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 491°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 4.8 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Gulf Oil Chemicals Co
Petrochemicals Division
Houston, Tex. 77001

2 Humphrey Chemical Co
Devine St
North Haven, Conn. 06473

3 Phillips Petroleum Co
Bartlesville, Okla. 74003

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 93 - 99% normal alpha olefins

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A 1 U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** 168.32

13 3 **Boiling Point at 1 atm.** 415°F = 213°C = 486°K

13 4 **Freezing Point:** −31.1°F = −35°C = 238°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.758 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 25.6 dynes/cm = 0.0256 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.05

13 12 **Latent Heat of Vaporization** 110 Btu/lb = 61.0 cal/g = 2.55 × 10⁵ J/kg

13 13 **Heat of Combustion** −19,911 Btu/lb = −10,906 cal/g = −439.87 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

DDB — DODECYLBENZENE

Common Synonyms

1 Phenyldodecane
n-Dodecylbenzene
Laurylbenzene
Detergent alkylate #2
Dodecylbenzene (linear)

Liquid | Colorless | Weak oily odor

Floats on water

[illegible] target if possible. Keep people away.
[illegible]
Avoid contact with liquid.
Isolate discharge material.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

Fire

Combustible
Extinguish with dry chemical, foam or carbon dioxide.
Water may be ineffective on fire.

Exposure

Call for medical aid.
LIQUID
Irritating to skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
If IN EYES, lift lids open and flush with plenty of water.
If SWALLOWED and victim CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Detergent Alkylate #2, n-Dodecylbenzene, Dodecylbenzene (linear), Laurylbenzene, 1-Phenyldodecane, UCANE Alkylate 12
3 2 **Coast Guard Compatibility Classification.** Aromatic hydrocarbon
3 3 **Chemical Formula:** $C_6H_5(CH_2)_{11}CH_3$
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Weak oily

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Liquid causes mild irritation of eyes and may cause allergenic responses on repeated contact with skin. Ingestion causes nausea.
5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min., get medical attention for persistent irritation. SKIN: wash with soap and water. INGESTION: do NOT induce vomiting, get medical attention.
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ 5.0 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to eyes and throat
5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 270°F (C.O.C.)
6 2 **Flammable Limits in Air** Data not available
6 3 **Fire Extinguishing Agents.** Dry chemical, foam
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature** Data not available
6 8 **Electrical Hazard** Data not available
6 9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Witco Chemical Corporation
Witfield Division
2100 E. 223rd Street
Carson, Calif. 90745

2 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

3 Continental Oil Company
Conoco Chemicals
Park Eights Plaza West One
Saddle Brook, N.J. 07662

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Various mixtures containing 70 - 80% of undecyl plus dodecyl benzene along with 10+ decylbenzene and other analogous hydrocarbons
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XII

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 240
13 3 **Boiling Point at 1 atm:** 550°F = 288°C = 561°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.860 at 20°C (liquid)
13 8 **Liquid Surface Tension** 30.12 dynes/cm = 0.0301 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** (est.) 30 dynes/cm = 0.030 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** [illegible] Btu/lb = 82 cal/g = 3.4 × 10^5 J/kg
13 13 **Heat of Combustion:** −18,100 Btu/lb = −10,000 cal/g = −41.8 × 10^6 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

DCS — DODECYLBENZENESULFONIC ACID, CALCIUM SALT

Common Synonyms
Calcium alkylaromatic sulfonate
Calcium alkylbenzenesulfonate

Liquid | Yellowish brown | Solvent odor

May float or sink in water

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

(SEE FOR MEDICAL AID)
LIQUID
Irritating to skin and eyes
If swallowed will cause nausea

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Calcium alkylaromatic sulfonate, Calcium alkylbenzenesulfonate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** ($C_{18}H_{29}C_6H_4SO_3)_2Ca$ solvent
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Amber
4.3 **Odor:** Hydrocarbon solvent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Has a drying effect on skin; prolonged contact may cause irritation
5.3 **Treatment for Exposure:** INGESTION: give large amount of water; do NOT induce vomiting. EYES: flush with water for at least 15 min. SKIN: wipe off, flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** <100°F (C.C.)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** ≥4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. The Richardson Company
Organic Chemicals Division
Melrose Park, IL 60160
2. Witco Chemical Corp.
Organics Division
277 Park Avenue
New York, N.Y. 10017
3. ICI United States Inc.
Concord Pike and New Murphy Road
Wilmington, Del. 19899

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 50-65% remainder a hydrocarbon solvent that is combustible or flammable
10.2 **Storage Temperature:** Ambient
10.2 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-1-L

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent (mixture)
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.02 at 25°C (liquid solute 2); 0.9 at 25°C (solvent)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(continued on page 1 and 3)

NOTES

DAI

DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT

Common Synonyms
Isopropylamine dodecylbenzenesulfonate

Solid — Off white

May float or sink and mix with water

Fire

Combustible

Exposure

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Isopropylamine dodecylbenzenesulfonate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $C_{15}H_{25}C_6H_4SO_3H \cdot NHC_3H_9$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or viscous liquid
4 2 **Color:** Off white
4 3 **Odor:** Liquid form has sweet petroleum type odor

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, goggles, mask (for liquid form)
5 2 **Symptoms Following Exposure:** Ingestion causes mild irritation of mouth and stomach. Contact with liquid causes irritation of eyes and to a prolonged contact, mild irritation of skin
5 3 **Treatment for Exposure:** INGESTION: give large amount of water, consult a doctor if large amount was ingested. EYES: flush with water for at least 15 min., consult a doctor if irritation persists. SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3. LD$_{50}$ 1.4 g (gram)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** (liquid) > 300 F C.C.
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:**
6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 The Richardson Company
100 New Street
Paterson, N. J. 07501

2 ICI United States Inc.
Concord Pike and New Murphy Rd.
Wilmington, Del. 19899

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 96+%, may also be shipped as a concentrated solution in a combustible petroleum solvent
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Handbook CG 448-4)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** 388.6
Boiling Point at 1 atm. Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.03 at 20°C (solid) 1.03 at 25°C (liquid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 4 and 5)

NOTES

DBS — DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT

Common Synonyms		
Triethanolamine dodecylbenzenesulfonate	Liquid	Yellowish brown
	Sinks and mixes with water	

Avoid contact with liquid. Keep people away.
Wear protective equipment.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with water. Use alcohol foam, carbon dioxide.

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS
do not give anything by mouth.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and pollution control agencies.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Triethanolamine dodecylbenzenesulfonate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $C_{12}H_{25}C_6H_4SO_3H \cdot N(CH_2CH_2OH)_3 \cdot H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Amber
4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, face mask or goggles
5 2 **Symptoms Following Exposure:** Ingestion may cause irritation of mouth and stomach. Contact with eyes or prolonged contact with skin may cause irritation.
5 3 **Treatment for Exposure:** INGESTION: give large amount of water, consult a doctor if large amount was ingested. EYES: flush with water, consult a doctor if irritation persists. SKIN: flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and irritating oxides of sulfur may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 The Richardson Company
Organic Chemicals Division
Melrose Park, Ill 60160

2 Ashland Chemical Co
P O Box 2219
Columbus, Ohio 43216

3 Stepan Chemical Co
Edens and Winnetka
Northfield, Ill 60093

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 60% solution in water
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 475.6 (solute)
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est) 1.12 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

DSD	DODECYL SULFATE, DIETHANOLAMINE SALT

Common Synonyms
Diethanolamine lauryl sulfate solution
Lauryl sulfate, diethanolamine salt solution

Liquid | Clear to pale yellow | Mild odor

May float or sink and mix with water

Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.
Remove contaminated clothing. Shoes
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED, do not induce vomiting. Have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS
Do not make victim vomit or give anything by mouth.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Diethanolamine lauryl sulfate solution
Lauryl sulfate, diethanolamine salt solution

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:**
$C_{16}H_{33}OSO_3H \cdot (HOCH_2CH_2)_2NH \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Clear pale yellow

4.3 **Odor:** Mild fatty

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles or face shield; protective gloves

5.2 **Symptoms Following Exposure:** Ingestion causes mild irritation of stomach. Liquid irritates eyes and causes some corneal damage after prolonged contact. Prolonged contact with skin causes mild irritation.

5.3 **Treatment for Exposure:** INGESTION: consult a doctor if large amount was ingested. EYES: wash well with water; consult a doctor if irritation persists. SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic vapors of diethanolamine and oxides of nitrogen may form in fires.

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Henkel Inc.
Chemical Specialties Div.
300 Alfred Avenue
Teaneck, N.J. 07666

2. E. I. duPont de Nemours & Co. Inc.
Dyes and Chemicals Division
1007 Market Street
Wilmington, Del. 19898

3. Ashland Chemical Co.
P.O. Box 2219
Columbus, Ohio 43216

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
35 - 40% solution in water

10.2 **Storage Temperature:** Below 38°C (100°F)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent (solution)

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.01 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1-DSD

NOTES

DSM — DODECYL SULFATE, MAGNESIUM SALT

Common Synonyms
Magnesium dodecyl sulfate
Magnesium lauryl sulfate
Lauryl sulfate, magnesium salt

Liquid | Light yellow | Mild odor

May float or sink and mix with water

Fire

Not flammable

Exposure

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Dispense and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Lauryl magnesium sulfate
Lauryl sulfate, magnesium salt
Magnesium dodecyl sulfate
Magnesium lauryl sulfate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(C_{12}H_{25}OSO_3)_2Mg \cdot 4H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Light yellow

4 3 **Odor:** Bland

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes mild irritation of stomach. Contact with liquid causes mild irritation of eyes. Skin is mildly irritated with prolonged contact.

5 3 **Treatment for Exposure:** INGESTION: consult a doctor if large amount was ingested. EYES: flush with water, consult a doctor if irritation persists. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9 *SELECTED MANUFACTURERS

Witco
[illegible] Reid Rd
Baltimore, Md. 21226

Surfact Co., Inc.
4888 South Steele Avenue
Blue Island, Ill. 60406

Stepan Chemical Co.
Edens and Winnetka
Northfield, Ill. 60093

10 SHIPPING INFORMATION

10 **Grades or Purity:**
25 - 30% solution in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

N P

12. HAZARD CLASSIFICATIONS

*12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

12. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** [illegible]

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.0 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

*13 12 **Latent Heat of Vaporization.**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 *5 **Heat of Solution:** Not pertinent

13 *6 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

DDS — DODECYL SULFATE, SODIUM SALT

Common Synonyms
Sodium lauryl sulfate
Lauryl sodium sulfate
Sodium dodecyl sulfate

Solid paste or liquid — White to gray — Mild odor

Sinks and mixes with water

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing

SOLID OR LIQUID
Will burn eyes
Irritating to eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lauryl sodium sulfate, Lauryl sulfate sodium salt, Sodium dodecyl sulfate, Sodium lauryl sulfate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{12}H_{25}OSO_3Na$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to pale yellow

4 3 **Odor:** Mild fatty

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves, dust mask or face shield

5 2 **Symptoms Following Exposure:** Inhalation of dust causes sneezing and coughing. Ingestion of large amounts causes irritation of stomach. Dust irritates eyes and may cause burns on prolonged contact. Contact with skin causes severe irritation, continued exposure to water soln. may cause drying out and cracking

5 3 **Treatment of Exposure:** INHALATION: remove from exposure. INGESTION: consult a doctor if large amounts have been ingested. EYES: flush well with water, consult doctor if irritation persists. SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1.6 grams/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 5 ppm 24 hr plaice LC_{50}

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 90% of theoretical in 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Henkel Inc.
Chemical Specialties Division
300 Alfred Avenue
Teaneck, N.J. 07666

2 E. I. du Pont de Nemours & Co. Inc.
Dyes and Chemicals Division
1007 Market Street
Wilmington, Del. 19898

3 Ashland Chemical Co.
P.O. Box 2219
Columbus, Ohio 43216

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 88-90%, pharmaceutical grade, also shipped as 25, 30% solutions in water

10 2 **Storage Temperature:** Below 38°C (100°F)

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 288

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** > 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

DST	DODECYL SULFATE, TRIETHANOLAMINE SALT

Common Synonyms			
Triethanolamine lauryl sulfate, Lauryl sulfate, triethanolamine salt	Liquid	Colorless	Mild odor
	Sinks and mixes with water		

Fire	Not flammable
Exposure	LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Dispense and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Lauryl sulfate triethanolamine salt
Triethanolamine lauryl sulfate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:**
$C_{12}H_{25}OSO_3H \cdot N(CH_2CH_2OH)_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Water white

4.3 **Odor:** Mild fatty

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Ingestion causes mild irritation of stomach. Contact with liquid irritates eyes and causes some corneal damage if prolonged. Skin is mildly irritated on prolonged contact.

5.3 **Treatment for Exposure:** INGESTION: consult a doctor if large amount was ingested. EYES: flush with water; consult a doctor if irritation persists. SKIN: flush with water.

5.4 **Toxicity by inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Data on vapors of triethanolamine and oxides of nitrogen may form in fire.

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Henkel Inc.
Chemical Specialties Div.
440 Alfred Avenue
Teaneck, N.J. 07666

Ashland Chemical Co.
P.O. Box 2219
Columbus, Ohio 43216

Stepan Chemical Co.
Edens and Winnetka
Northfield, Ill. 60093

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 40-45% solution in water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A,P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 435 (calculated)

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** less than 1 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4

NOTES

DTC DODECYLTRICHLOROSILANE

Common Synonyms	Liquid Colorless Sharp irritating odor Reacts with water. Irritating gas is produced on contact with water
	[illegible]
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. [illegible] CONTAIN RUNOFF FOR DISPOSAL.
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat [illegible] LIQUID Will burn skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning. Eliminate water contamination.

Restrict access.

Dispose of flush with care.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_{12}H_{25}SiCl_3$

3.4 **IMCO/United Nations Numerical Designations:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp and hydrochloric acid; pungent and irritating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirator, protective rubber gloves, chemical worker's goggles, other protective equipment as necessary to prevent eyes and skin contact.

5.2 **Symptoms Following Exposure:** Inhalation irritates the mucous membrane. Contact with liquid causes severe burns to eyes and skin. Ingestion causes severe burns of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure, support respiration and physician if needed. EYES: flush with water for 15 minutes, obtain medical attention immediately. SKIN: flush with water, wash with soap, obtain medical attention if irritation persists. INGESTION: induce vomiting, give large amounts of water, then milk or milk of magnesia.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 Data: 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will avoid high concentrations if practical. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes severe and third degree burns on short contact and is very dangerous to the eyes.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** > 200°F (93°C)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water jets

6.5 **Special Hazards of Combustion Products:** Hydrochloric acid and phosgene when heated to high temperatures

6.6 **Behavior in Fire:** Different containers exposed may react. Contact with water applied to adjacent fires produces irritating hydrogen chloride fumes

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Generates hydrogen chloride and hydrochloric acids

7.2 **Reactivity with Common Materials:** Reacts with surface moisture to generate hydrogen chloride which is corrosive to [illegible]

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water. Rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

[illegible]

[illegible]

PCR Inc.
P O Box 355
Gainesville, Fla. 32602

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Not required

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

4.0

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	*
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	*
Reactivity	
Other Chemicals	*
Water	2
Self Reaction	

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 401.9

13.3 **Boiling Point at 1 atm:** >300°F = >149°C = >422 K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.0 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DTH	DOWTHERM

Common Synonyms

Liquid Light to dark brown Fragrant odor

May float or sink in water. Freezing point is 54° F

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes.
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
3 2 **Coast Guard Compatibility Classification:**
3 3 **Chemical Formula:**
3 4 **IMCO United Nations Numerical Designation:**

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:**
4 3 **Odor:**

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:**
5 2 **Symptoms Following Exposure:**
5 3 **Treatment for Exposure:** INHALATION
INGESTION
EYE OR SKIN
5 4 **Toxicity by Inhalation (Threshold Limit Value):**
5 5 **Short-Term Inhalation Limits:**
5 6 **Toxicity by Ingestion:**
5 7 **Late Toxicity:**
5 8 **Vapor (Gas) Irritant Characteristics:**
5 9 **Liquid or Solid Irritant Characteristics:**
5 10 **Odor Threshold:**

6 FIRE HAZARDS

6 1 **Flash Point:**
6 2 **Flammable Limits in Air:**
6 3 **Fire Extinguishing Agents:**
6 4 **Fire Extinguishing Agents Not to be Used:**
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:**
6 8 **Electrical Hazard:**
6 9 **Burning Rate:**

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:**
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:**
7 4 **Neutralizing Agents for Acids and Caustics:**
7 5 **Polymerization:**
7 6 **Inhibitor of Polymerization:**

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
8 2 **Waterfowl Toxicity:**
8 3 **Biological Oxygen Demand (BOD):**
8 4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

10. SHIPPING INFORMATION

10 1 **Grades of Purity:**
10 2 **Storage Temperature:**
10 3 **Inert Atmosphere:**
10 4 **Venting:**

11 HAZARD ASSESSMENT CODE

XTIXY

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Toxicity	
Liquid and Solid Toxicity	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemicals	
Water	
Self Reaction	

12 3 **NFPA Hazard Classifications:**
Not rated

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:**
13 3 **Boiling Point at 1 atm:**
13 4 **Freezing Point:**
13 5 **Critical Temperature:**
13 6 **Critical Pressure:**
13 7 **Specific Gravity:**
13 8 **Liquid Surface Tension:**
13 9 **Liquid-Water Interfacial Tension:**
13 10 **Vapor (Gas) Specific Gravity:**
13 11 **Ratio of Specific Heats of Vapor (Gas):**
13 12 **Latent Heat of Vaporization:**
13 13 **Heat of Combustion:**
13 14 **Heat of Decomposition:**
13 15 **Heat of Solution:**
13 16 **Heat of Polymerization:**

NOTES

EDR

ENDRIN

Common Synonyms

1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,endo-1,4,5,8-dimethanonaphthalene
Hexadrin
Mendrin

Solid or solution | Colorless to tan | Odorless

Sinks in water

AVOID CONTACT WITH LIQUID SOLID AND DUST KEEP PEOPLE AWAY

W[illegible] of contaminated clothing and shoes

S[illegible] soil

C[illegible]

E[illegible]

N[illegible] with alkalies, lithium salts, or oxidizers

Fire

Combustible solution or non flammable solid
POISONOUS GASES ARE PRODUCED IN FIRE

Extinguish with dry [illegible] carbon dioxide, foam
Water may be ineffective on fire

Exposure

CALL FOR MEDICAL AID

DUST

POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes, nose and throat

M[illegible]

[illegible]

D[illegible]

LIQUID OR SOLID

POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes

R[illegible]

Flush affected areas with plenty of water
IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED [illegible] CONSCIOUS [illegible]
or milk and [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR [illegible]
VULSIONS [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

Notify [illegible] authorities
N[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,endo-1,4,5,8-dimethanonaphthalene, Hexadrin, Mendrin

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_{12}H_8Cl_6O$

3 4 **IMCO/United Nations Numerical Designation:** 6.1/1615

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid (Sometimes shipped as an emulsifiable concentrate in xylene solution)

4 2 **Color:** Colorless to tan

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirator for spray, fog or dust, rubber gloves and boots

5 2 **Symptoms Following Exposure:** Inhalation causes moderate irritation of nose and throat prolonged breathing may cause same toxic symptoms as for ingestion. Contact with liquid causes moderate irritation of eyes and skin. Prolonged contact with skin may cause same toxic symptoms as for ingestion. Ingestion causes frothing of the mouth, facial congestion, convulsions, violent muscular contractions, dizziness, weakness, nausea

5 3 **Treatment for Exposure:** Get medical attention after all exposures to this compound. INHALATION: remove from exposure. EYES: flush with water for at least 15 min. SKIN: wash with plenty of soap and water, but do not scrub. INGESTION: remove from the gastrointestinal tract, either by inducing vomiting (unless hydrocarbon solvents are involved and the amount of insecticide is well below the toxic amount) or by gastric lavage with saline solution. Saline cathartics may also be beneficial. Fats and oils should be avoided. Sedation with barbiturates is indicated if signs of CNS irritation are present; patient should have absolute quiet, expert nursing care, and a minimum of external stimuli to reduce danger of convulsions. Epinephrine is contraindicated in view of the danger of precipitating ventricular fibrillation. If material ingested was dissolved in a hydrocarbon solvent, observe patient for possible development of hydrocarbon pneumonitis.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³

5 5 **Short-Term Inhalation Limits:** 0.5 mg/m³ for 30 min

5 6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 3 mg/kg (rat)

5 7 **Late Toxicity:** None known

6 FIRE HAZARDS

6 1 **Flash Point:** Non flammable solid or combustible solution
>80 F O C (xylene)

6 2 **Flammable Limits in Air:**
[illegible] (xylene)

6 3 **Fire Extinguishing Agents** (Solution)
Dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.**
Water may be ineffective on solution fire

6 5 **Special Hazards of Combustion Products**
Toxic hydrogen chloride and phosgene may be generated when solution burns

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** 4 mm/min (xylene)

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.005 ppm 48 hr carp TL$_m$ fresh water
0.0025 ppm 48 hr brown shrimp TL$_m$ salt water

8 2 **Waterfowl Toxicity:** LD_{50} = 5.64 mg/kg

8 3 **Biological Oxygen Demand (BOD):**
Data not available

8 4 **Food Chain Concentration Potential**
Probable

9 SELECTED MANUFACTURERS

1 Velsicol Chemical Corp
341 East Ohio St
Chicago, Ill. 60611

2 Shell Chemical Co
1 Shell Plaza
Houston, Texas 77002

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 95-98%
Dry formulations up to 75% endrin
liquid formulations up to 25% in flammable xylene

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Poisonous Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification	
	Solution	Dry
Health Hazard (Blue)	3	2
Flammability (Red)	1	0
Reactivity (Yellow)	0	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 380.92

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point:** 392 F = 200°C = 473 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 1.65 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

5 HEALTH HAZARDS (Cont'd.)

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold** Not pertinent (solid)

EPC EPICHLOROHYDRIN

Common Synonyms
1-Chloro-2,3-epoxypropane
3-Chloro-1,2-propylene oxide

Watery liquid | Colorless | Sweet garlic odor

Sinks and mixes with water
Poisonous, flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR Keep people away
Wear goggles self contained breathing apparatus and rubber overclothing (including gloves)
Stop discharge if possible
Call fire department
Stay upwind and use water spray to knock down vapor
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Vapor may explode if ignited in an enclosed area
Wear goggles self contained breathing apparatus and rubber overclothing (including gloves)
Cool at fires from safe distance or protected location
Extinguish with water, dry chemical, alcohol foam or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes
Move to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk, and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep patient warm

Water Pollution

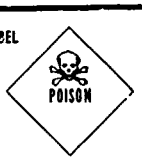
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
1-Chloro-2,3-epoxypropane
Chloromethyloxirane
gamma-Chloropropylene oxide
3-Chloro-1,2-propylene oxide

3.2 **Coast Guard Compatibility Classification.**
Epichlorohydrin

3.3 **Chemical Formula**
C_3H_5ClO

3.4 **IMCO/United Nations Numerical Designation:** 6.1 2023

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color.** Colorless

4.3 **Odor:** Pungent garlic sweet pungent like chloroform

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Air pack or organic canister mask protective gloves and goggles

5.2 **Symptoms Following Exposure:** Vapor is irritating to eyes nose and throat may cause headache nausea vomiting and central nervous system depression Rapidly fatal if swallowed Causes nausea vomiting and collapse Skin contact is irritating

5.3 **Treatment for Exposure:** INHALATION remove victim to fresh air keep him warm and quiet and get medical attention immediately if breathing stops start artificial respiration INGESTION induce vomiting (but only if victim is conscious and without convulsions) and call a physician promptly no specific antidote known EYES OR SKIN immediately flush with water for at least 15 min and get medical attention remove contaminated clothing and wash before reuse

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits.** 10 ppm for 30 min

5.6 **Toxicity by Ingestion.** Grade 3 LD_{50} 50 to 500 mg/kg

5.7 **Late Toxicity:** Causes cancer in experimental animals

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Liquid severe skin irritant May cause pain and second degree burns after a few minutes contact

5.10 **Odor Threshold:** 10 ppm

6. FIRE HAZARDS

6.1 **Flash Point** 92°F O.C. 100°F C.C.

6.2 **Flammable Limits in Air:** 3% - 21.0%

6.3 **Fire Extinguishing Agents:** Alcohol foam dry chemical carbon dioxide water spray

6.4 **Fire Extinguishing Agents Not to be Used** Avoid use of dry chemical if fire occurs in container with confined vent

6.5 **Special Hazards of Combustion Products:** Toxic irritating vapors are generated when heated

6.6 **Behavior in Fire:** Containers may explode in fire because of polymerization

6.7 **Ignition Temperature:** 804°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.6 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Mild reaction not likely to be hazardous

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Can polymerize in presence of strong acids and bases particularly when hot

7.6 **Inhibitor of Polymerization.** None used

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** 36 ppm/48 hrs/Rasbora (fish)/TL_m/freshwater

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich. 48640

2 Shell Chemical Co
Industrial Chemicals Division
Houston, Texas 77001

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.0%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A.P.Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Poison Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	1
Self Reaction	2

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** 92.53

13.3 **Boiling Point at 1 atm**
239.4°F = 115.2°C = 388.4 K

13.4 **Freezing Point**
-72.6°F = -58.1°C = 215.1 K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.18 at 20°C (liquid)

13.8 **Liquid Surface Tension**
35.0 dynes/cm = 0.037 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity.**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.155

13.12 **Latent Heat of Vaporization**
176 Btu/lb = 97.9 cal/g = 4.10 × 10⁵ J/kg

13.13 **Heat of Combustion** -8143 Btu/lb
= -4525 cal/g = -189.4 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

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EVO — EPOXIDIZED VEGETABLE OILS

Common Synonyms
Epoxidized drying oils
Epoxidized oils

Oily liquid — Pale yellow — Odorless

Floats on water

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible.
Extinguish with foam, dry chemical or carbon dioxide

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Drying oil epoxides
Epoxidized drying oils
Epoxidized oils

3.2 **Coast Guard Compatibility Classification.**
Glycol ethers

3.3 **Chemical Formula.**
(OCRHCHRCOO)$_3$CH

3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to yellow
4.3 **Odor:** Very weak

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available
5.2 **Symptoms Following Exposure:** Data not available
5.3 **Treatment for Exposure:** Data not available
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion** Grade 0. LD$_{50}$ above 15 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** None expected
5.9 **Liquid or Solid Irritant Characteristics** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** 555°F O.C.
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature** Data not available
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction
7.2 **Reactivity with Common Materials.** No reaction
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 240 ppm/24 hr/brine shrump/TL$_m$
8.2 **Waterfowl Toxicity:**
8.3 **Biological Oxygen Demand (BOD):** 4% of theoretical in 5 days, fresh water, acclimated seed
8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

1 Ashland Oil Inc
Chemical Products Division
Columbus, Ohio 43216

2 Swift & Co
Swift Agricultural Chemicals Corp
Wilmington, N. C. 28401

3 Witco Chemical Corp
Argus Chemical Corp. Division
633 Court St.
Brooklyn, N. Y. 11231

10. SHIPPING INFORMATION

10.1 **Grades or Purity.**
Epoxidized vegetable oil
Epoxidized soybean oil

10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight.** Not pertinent
13.3 **Boiling Point at 1 atm.** Very high
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.0 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 36.2 dynes/cm = 0.0362 N/m at 24°C
13.9 **Liquid-Water Interfacial Tension:** 50 dynes/cm = 0.05 N/m at 22.7°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion** (est.) = 13,000 Btu/lb = −7,000 cal/g = −30.0 × 10^3 J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

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ETH	# ETHANE

Common Synonyms	Liquefied compressed gas Colorless Mild gasoline-like odor Floats and boils on water Flammable visible vapor cloud is produced
	[illegible]
Fire	**FLAMMABLE** **Flashback along vapor trail may occur** **Vapor may explode if ignited in an enclosed area** [illegible]
Exposure	CALL FOR MEDICAL AID **VAPOR** **If inhaled will cause difficult breathing** **Not irritating to eyes, nose or throat** [illegible] **LIQUID** **Will cause frostbite.** [illegible] DO NOT RUB AFFECTED AREAS
Water Pollution	Not harmful

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning high flammability
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Methylmethane

3 2 **Coast Guard Compatibility Classification**
Paraffin

3 3 **Chemical Formula:** C_2H_6

3 4 **IMCO United Nations Numerical Designation** 2 0 1035

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):**
Liquid or compressed gas

4 2 **Color** Colorless

4 3 **Odor:** Weak sweetish

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Self contained breathing apparatus for high vapor concentrations

5 2 **Symptoms Following Exposure** In high vapor concentrations can act as simple asphyxiant
Liquid causes severe frostbite

5 3 **Treatment for Exposure.** Remove from exposure support respiration

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion** Not pertinent

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics** No appreciable hazard Practically harmless to the skin because it is very volatile and evaporates quickly

5 10 **Odor Threshold:** 3000 ppm

6 FIRE HAZARDS

6 1 **Flash Point** −211°F

6 2 **Flammable Limits in Air**
2.9% 13.0%

6 3 **Fire Extinguishing Agents:**
Stop flow of gas

6 4 **Fire Extinguishing Agents Not to be Used**
Data not available

6 5 **Special Hazards of Combustion Products**
Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** 940°F

6 8 **Electrical Hazard** Class I group D

6 9 **Burning Rate:** 3.3 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
None

8 2 **Waterfowl Toxicity** None

8 3 **Biological Oxygen Demand (BOD).**
None

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield Co
ARCO Chemical Co Division
260 South Broad St
Philadelphia Pa 19101

2 Cities Service Co Inc
Petrochemicals Division
60 Wall St
New York N Y 10005

3 Phillips Petroleum Co
Bartlesville Okla 74004

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Research pure

10 2 **Storage Temperature:** −128°F

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3)

A B C D E F G

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Gas

13 2 **Molecular Weight:** 30.07

13 3 **Boiling Point at 1 atm**
−127.5°F = −88.6°C = 184.6°K

13 4 **Freezing Point**
−279.9°F = −183.3°C = 89.9°K

13 5 **Critical Temperature**
90.1°F = 32.3°C = 305.5°K

13 6 **Critical Pressure:**
708.0 psia = 48.16 atm = 4.879 MN/m²

13 7 **Specific Gravity** 0.546 at −88°C (liquid)

13 8 **Liquid Surface Tension.**
16 dynes/cm = 0.016 N/m at −88°C

13 9 **Liquid-Water Interfacial Tension:**
(est.) 45 dynes/cm = 0.045 N/m at −88°C

13 10 **Vapor (Gas) Specific Gravity:** 1.1

13 11 **Ratio of Specific Heats of Vapor (Gas).**
1.191

13 12 **Latent Heat of Vaporization**
211 Btu/lb = 117 cal/g = 4.90 × 10⁵ J/kg

13 13 **Heat of Combustion:** −20,293 Btu/lb
= −11,274 cal/g = −472.02 × 10³ J/g

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

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EHP ETHOXYDIHYDROPYRAN

Common Synonyms
2-Ethoxy-3,4-dihydro-2H-pyran

Liquid Colorless

Floats on water

Fire

Combustible

Exposure

Exposure data not available

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

Not Label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Ethoxy-3,4-dihydro-2H-pyran

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $C_7H_{12}O_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure.** Contact with liquid irritates eyes. Also irritates skin on prolonged contact

5.3 **Treatment for Exposure** EYES flush with water for at least 15 min. SKIN wipe off, wash well with soap and water. INGESTION induce vomiting, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits.** Not pertinent

5.6 **Toxicity by Ingestion** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 98 F O C

6.2 **Flammable Limits in Air** Data not available

6.3 **Fire Extinguishing Agents.** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.8 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Guardian Chemical Corporation
Eastern Chemical Division
P.O. Box 2800-B
Hauppauge, N.Y. 11788

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

NFU

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight** 128.17

13.3 **Boiling Point at 1 atm** 289 F = 143 C = 416 K

13.4 **Freezing Point.** −145 F = −100 C = 173 K

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.875 at 20 C (liquid)

13.8 **Liquid Surface Tension** (est.) 28 dynes/cm = 0.028 N/m at 20 C

13.9 **Liquid-Water Interfacial Tension** (est.) 30 dynes/cm = 0.030 N/m at 20 C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization.** (est.) 120 Btu/lb = 69 cal/g = 2.9 × 10⁵ J/kg

13.13 **Heat of Combustion.** (est.) −14,000 Btu/lb = −7,900 cal/g = −330 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

EOD — ETHOXYLATED DODECANOL

Common Synonyms
Ethoxylated dodecyl alcohol
Ethoxylated lauryl alcohol
Tergitol nonionic TMN

Oily liquid | Colorless to yellow | Pleasant odor

Mixes slowly with water. Freezing point is 61° F

Avoid contact with liquid
Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with water fog, dry chemical, carbon dioxide

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin
Will burn eyes
Harmful if swallowed
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Ethoxylated dodecyl alcohol
Ethoxylated lauryl alcohol
Polyoxyethyl dodecyl ether
Polyoxyethyl lauryl ether
Tergitol Nonionic TMN

3 2 **Coast Guard Compatibility Classification**
Alcohol

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Mild and pleasant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Plastic gloves, goggles
5 2 **Symptoms Following Exposure:** Liquid causes eye injury and defats the skin, causing irritation
5 3 **Treatment for Exposure:** Flush eyes with water for at least 15 min. Wash skin well with water. Get medical attention.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent.
5 5 **Short-Term Inhalation Limits:** Not pertinent.
5 6 **Toxicity by Ingestion:** Grade 1 (> 15 g/kg, rats)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** Liquid causes eye injury. Contact with skin may cause irritation.
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** 420° F O C
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. BASF Wyandotte Corp
Industrial Chemicals Group
Wyandotte, Mich. 48192
2. Jefferson Chemical Co.
4336 Richmond Ave.
Houston, Tex. 77092
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N. Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Usually 100%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

V P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 450 - 626
13 3 **Boiling Point at 1 atm.** Very high
13 4 **Freezing Point:** 61° F = 16 C = 289 K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.0 at 20 C (liquid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** (est.) = -1,200 Btu/lb = -6,700 cal/g = -280 kJ/g
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4

3 CHEMICAL DESIGNATIONS (Cont'd)

3 3 **Chemical Formula:**
$C_{12}H_{25}O(CH_2CH_2O)_nCH_2CH_2OH$
n=6 (average)

3 4 **IMCO United Nations Numerical Designation:** Not listed

ENP — ETHOXYLATED NONYLPHENOL

Common Synonyms	Liquid or solid	White	Mild odor
	May float or sink in water		

Avoid contact with liquid and solid. Keep people away.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemicals, foam, carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID OR SOLID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (two glasses at most).
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting or give anything by mouth.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Coast Guard Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification.** Group 1 ether
3 3 **Chemical Formula:** $C_9H_{19}C_6H_4OC_2H_4O_nH$ where n = 4 – 100
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid or solid
4 2 **Color:** White
4 3 **Odor:** Mild aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gloves and safety glasses
5 2 **Symptoms Following Exposure:** Contact with eyes causes irritation. Prolonged contact with skin causes irritation.
5 3 **Treatment for Exposure:** No treatment required for inhalation or ingestion. EYES: flush with copious quantities of tap water for 15 min. and seek appropriate medical attention. SKIN: wash affected areas with soap and water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Grade 2; oral LD_{50} = 1 310 mg/kg (rats)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** (Burns with difficulty) Cleveland Open Cup: 600°F (315°C) > 480°F (249°C)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents.** Water, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.**
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 1 (10 – 1 000 ppm for bluegills LC_{50} (increased ethyleneoxide chain length gives decreased toxicity)
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** 0.5 2.0% of theoretical in 5 days
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Diamond Shamrock Chemical Co.
1100 Superior Avenue
Cleveland, Ohio 44114

2 GAF Corp.
140 West 51 St.
New York, N.Y. 10020

3 Monsanto Company
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

(liquid) YP
(solid) SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid or liquid
13 2 **Molecular Weight:** > 900
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.99 – 1.07 at 25°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

ECP ETHOXYLATED PENTADECANOL

Common Synonyms
Ethoxylated pentadecylalcohol
Tergitol nonionic 45-S-10

Liquid | Colorless to yellow | Pleasant odor

Mixes slowly with water. Freezing point is 59° F

Avoid contact with liquid
Air-supplied mask if possible
[illegible]

Fire

Combustible
[illegible]

Exposure

ALCOHOL-LIKE ODOR

LIQUID
Irritating to skin
Will burn eyes
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Ethoxylated pentadecyl alcohol
Polyoxyethylene pentadecyl ether
Tergitol Nonionic 45-S-10

3 2 **Coast Guard Compatibility Classification**
Alcohol

3 3 **Chemical Formula:**
$C_{15}H_{31}O(C_2H_4O)_nC_2H_4OH$
n = 10 (average)

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Plastic gloves, goggles

5 2 **Symptoms Following Exposure:** Liquid causes eye burns and defats the skin, causing irritation

5 3 **Treatment for Exposure:** Flush eyes with water for at least 15 min. Wash skin with water. Get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** None

5 9 **Liquid or Solid Irritant Characteristics:** Liquid causes eye burns. Can cause mild skin irritation after repeated or prolonged contact. Wash skin with soap and water

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point.** 470° F C.C.

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Carbon dioxide or dry chemical for small fires; alcohol foam and water for large fires

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. BASF Wyandotte Corp
Industrial Chemicals Group
Wyandotte, Mich. 48192

2. Jefferson Chemical Co
3376 Richmond Ave
Houston, Texas 77082

3. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Usually 100%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

XPQ

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm.** [illegible]

13 4 **Freezing Point:** [illegible]

13 5 **Critical Temperature:** [illegible]

13 6 **Critical Pressure:** [illegible]

13 7 **Specific Gravity:** [illegible]

13 8 **Liquid Surface Tension:** [illegible]

13 9 **Liquid-Water Interfacial Tension**
[illegible]

13 10 **Vapor (Gas) Specific Gravity:**
[illegible]

13 11 **Ratio of Specific Heats of Vapor (Gas):**
[illegible]

13 12 **Latent Heat of Vaporization**
[illegible]

13 13 **Heat of Combustion:** [illegible]

13 14 **Heat of Decomposition:** [illegible]

13 15 **Heat of Solution** [illegible]

13 16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

EOT ETHOXYLATED TETRADECANOL

Common Synonyms
Ethoxylated tetradecyl alcohol
Ethoxylated myristyl alcohol
Tergitol nonoxnol 45-S-10

Liquid | Colorless to yellow | Pleasant odor

Mixes slowly with water. Freezing point is 59° F

Fire

Combustible

Exposure

LIQUID
Irritating to skin
Will burn eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4:

Dispersal and Flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethoxylated myristyl alcohol
Ethoxylated tetradecyl alcohol
Polyoxyethylene myristyl ether
Polyoxyethylene tetradecyl ether
Tergitol Nonionic 45-S-10

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $C_{14}H_{29}O(C_2H_4O)_nH$ $C_{14}H_{29}OH$
n = 0 (average) Continued on page 4

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild pleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Plastic gloves, goggles

5.2 **Symptoms Following Exposure:** Liquid causes eye burns and defatting of skin causing irritation

5.3 **Treatment for Exposure:** Flush eyes with water for at least 15 min. Wash skin well with water. Get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** Liquid causes eye burns. Contact with skin may irritate.

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 470°F O.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol foam and water for large fires

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. BASF Wyandotte Corp.
Industrial Chemicals Group
Wyandotte, Mich. 48192

2. Jefferson Chemical Co.
3376 Richmond Ave.
Houston, Texas 77082

3. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Usually 100%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3:

NPO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 444

13.3 **Boiling Point at 1 atm:** Very high

13.4 **Freezing Point:** 59°F = 15°C = 288°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.9053 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** (est.) = -11,000 Btu/lb = -6,200 cal/g = -260 X 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) = 9 Btu/lb = -5 cal/g = -0.2 X 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4

3. CHEMICAL DESIGNATIONS (Cont'd)

3.4 **IMCO United Nations Numerical Designation:** Not listed

ETD	ETHOXYLATED TRIDECANOL

Common Synonyms			
Ethoxylated tridecyl alcohol Tergitol nonionic 3A-6	Liquid	Colorless to yellow	Pleasant odor

Avoid contact with liquid
[illegible]

Fire	Combustible Extinguish with [illegible] carbon dioxide
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin Will burn eyes Harmful if swallowed [illegible] SWALLOWED - [illegible] DO NOT induce vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Dispense and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethoxylated tridecyl alcohol
Polyoxyethylene tridecyl ether
Tergitol 3-A-6 Nonionic

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:**
$C_{13}H_{27}O(CH_2CH_2O)_6CH_2CH_2OH$
(n = 6 (average))

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild pleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Plastic gloves, goggles

5.2 **Symptoms Following Exposure:** Liquid causes eye injury and defats the skin, causing irritation

5.3 **Treatment for Exposure:** In case of contact with eyes, immediately flush with plenty of water for at least 15 min. get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2 LD50 (Rat) [illegible] g/kg or ml/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** Liquid causes eye injury. Contact with skin may cause irritation

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible] C.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, alcohol foam and water for large fires

6.4 **Fire Extinguishing Agents Not to be Used:** Data not available

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Not reactive

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. BASF Wyandotte Corp
Industrial Chemicals Group
Wyandotte, Mich. 48192
2. Jefferson Chemical Co
1776 Richmond Ave
Houston, Texas 77042
3. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Usually 100%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arresters

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-444-2

NPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 444

13.3 **Boiling Point at 1 atm:** Very high

13.4 **Freezing Point:** Data not available

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.00 at 15°C (Liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** (est.) = -[illegible] Btu/lb
= -6,200 cal/g = -260 kJ/g

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) = 50
= 50 cal/g = 210 kJ/g

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

ETG — ETHOXY TRIGLYCOL

Common Synonyms			
Ethoxytriethylene glycol Triethylene glycol monoethyl ether	Liquid	Colorless	Odorless
	Sinks and mixes with water		

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, alcohol foam, carbon dioxide
Water and foam may be ineffective on fire
Cool exposed containers with water

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearest water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-2

Dissolve and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Diethylene glycol monoethyl ether
Triethylene glycol monoethyl ether
Triethylene monoethyl ether

3.2 **Coast Guard Compatibility Classification.** Group C

3.3 **Chemical Formula:** $C_2H_5OC_2H_4OC_2H_4OC_2H_4OH$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Practically odorless characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles and rubber gloves should be worn

5.2 **Symptoms Following Exposure:** No appreciable hazard in ordinary handling of this material

5.3 **Treatment for Exposure:** Wash affected parts with water

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade I [illegible] rating

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are not irritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 275°F OC

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Dry chemical, carbon dioxide, or alcohol foam

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. [illegible]
2. Olin Corp.
Chemicals Division
275 Long Ridge Rd.
Stamford, Conn. [illegible]
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

APO

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	-
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion.** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

ETA — ETHYL ACETATE

Common Synonyms
Acetic acid ethyl ester
Acetic ester
Vinegar naphtha

Water: liquid Colorless Pleasant fruity odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause headache, dizziness, nausea or loss of consciousness.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic acid ethyl ester; Acetic ester; Acetic ether; Ethyl acetate
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** $CH_3COOC_2H_5$
3.4 **IMCO United Nations Numerical Designation:** 1173

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pleasant fruity

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister mask; goggles or face shield
5.2 **Symptoms Following Exposure:** Headache, irritation of eyes, nausea, dizziness, and coma; respiratory failure
5.3 **Treatment for Exposure:** INHALATION: Give oxygen; resuscitate if breathing has stopped; call physician. SKIN: Wash with soap and water. EYES: Flush with water; call physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 400 ppm
5.5 **Short-Term Inhalation Limits:** 1000 ppm
5.6 **Toxicity by Ingestion:** Grade 1: LD50 = 4.1 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes eye irritation and lacrimation at concentrations above 400 ppm; severe irritation at 1000 ppm.
5.9 **Liquid or Solid Irritant Characteristics:** Moderate irritation of eyes and skin. May cause burning sensation and reddening of skin.
5.10 **Odor Threshold:** 5 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 24°F C.C. (-4°C)
6.2 **Flammable Limits in Air:** 2.2% - 11.5%
6.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire:** Vapor may explode
6.7 **Ignition Temperature:** 800°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 3.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** No recommendation
7.5 **Polymerization:** Will not occur
7.6 **Inhibitor of Polymerization:** None necessary

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 1.60 lbs/lb over 5 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Eastman Kodak Co.
   Texas Eastman Div.
   Kingsport, Tenn. 37662
2. Monsanto Co.
   Monsanto Industrial Chemicals Co.
   800 North Lindbergh Blvd.
   St. Louis, Mo. 63166
3. Union Carbide Corp.
   Chemicals and Plastics Div.
   270 Park Ave.
   New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 85%, 99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrestor or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG-446-2)

APO

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Toxicity	
Liquid or Solid Toxicity	
Persistence	1
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard Rating	
Flammability Rating	3
Reactivity Rating	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 88
13.3 **Boiling Point at 1 atm:** 171°F = 77°C = 350°K
13.4 **Freezing Point:** -117°F = -83°C = 190°K
13.5 **Critical Temperature:** 482°F = 250°C = 523°K
13.6 **Critical Pressure:** 550 psia = 37 atm = 3.8 MN/m²
13.7 **Specific Gravity:** 0.90 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 6.79 dynes/cm = 0.0068 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.0
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.035
13.12 **Latent Heat of Vaporization:** 169 Btu/lb = 93 cal/g = 3.9 x 10⁵ J/kg
13.13 **Heat of Combustion:** -11,500 Btu/lb = -6,390 cal/g = -26.8 x 10⁶ J/kg
13.14 **Heat of Decomposition:** None reported
13.15 **Heat of Solution:** None reported
13.16 **Heat of Polymerization:** None reported

Continued on next page

NOTES

REVISED 1978

EAA — ETHYL ACETOACETATE

Common Synonyms

Acetoacetic acid ethyl ester
Acetoacetic ester
Diacetic ether
Ethyl beta-ketobutyrate
EAA

Liquid — Colorless — Pleasant fruity odor

Mixes with water

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and remove contained material.
Notify local health and pollution control agencies.

Fire

Combustible

Extinguish with foam, carbon dioxide, dry chemical or water spray.

Exposure

Call physician.

LIQUID

Irritating to eyes.
Harmful if swallowed.

Remove contaminated clothing.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids apart and flush eyes with water.
IF SWALLOWED, induce vomiting. DO NOT induce vomiting unless directed to do so by physician.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Immediately notify cognizant authorities.
Dike area and dam.

2. LABELS

No requirements listed in Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetoacetic acid ethyl ester; Acetoacetic ester; Diacetic ether; Ethyl beta-ketobutyrate; EAA

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_3COCH_2COOC_2H_5$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Aromatic fruity

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles; face shield; rubber gloves

5.2 **Symptoms Following Exposure:** Liquid may cause mild irritation of eyes

5.3 **Treatment for Exposure:** EYES: flush with water for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Rabbit 2 gm/kg LD_{50} [unreported]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 175°F OC, 194°F CC

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, water spray, foam

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not known

6.6 **Behavior in Fire:** Not known

6.7 **Ignition Temperature:** 900°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Not known

7. CHEMICAL REACTIVITY

*7.1 **Reactivity with Water:** Not reactive

*7.2 **Reactivity with Common Materials:** Not reactive

*7.3 **Stability During Transport:** Stable

*7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

*7.5 **Polymerization:** Not pertinent

*7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Eastman Chemical Products Inc.
Kingsport, Tennessee 37662

Lonza Inc.
22-08 Route 208
Fair Lawn, New Jersey 07410

Aldrich Chemical
940 West St. Paul Ave.
Milwaukee, Wisconsin 53233

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99%

*10.2 **Storage Temperature:** Ambient

*10.3 **Inert Atmosphere:** No requirement

*10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NPQ

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Not listed

*12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

*12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid

*13.2 **Molecular Weight:** 130

*13.3 **Boiling Point at 1 atm:** 365°F = 185°C = 458°K

*13.4 **Freezing Point:** 11°F = -12°C = 261°K

*13.5 **Critical Temperature:** Not pertinent

*13.6 **Critical Pressure:** Not pertinent

*13.7 **Specific Gravity:** 1.029 at 20°C (liquid)

*13.8 **Liquid Surface Tension:** [illegible] dynes/cm = [illegible] N/m at 20°C

*13.9 **Liquid-Water Interfacial Tension:** [illegible] dynes/cm = [illegible] N/m at 20°C

*13.10 **Vapor (Gas) Specific Gravity:** 4.46

*13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

*13.12 **Latent Heat of Vaporization:** 180 Btu/lb = [illegible] cal/gm at 185°C

*13.13 **Heat of Combustion:** -14,450 Btu/lb = [illegible] cal/gm at 25°C

*13.14 **Heat of Decomposition:** Not pertinent

*13.15 **Heat of Solution:** Not known

*13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

EAC ETHYL ACRYLATE

Common Synonyms
Acrylic acid, ethyl ester
Ethyl 2-propenoate

Liquid | Colorless | Fruity odor

Floats on water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE.
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache or nausea

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

Isolate spill. Keep flammables (-) away.
Restrict access.
Evacuate area.
Dispose of properly.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acrylic acid, ethyl ester; Ethyl 2-propenoate
3.2 **Coast Guard Compatibility Classification:** Acrylate
3.3 **Chemical Formula:** $CH_2CHCOOC_2H_5$
3.4 **IMCO United Nations Numerical Designation:** 1917

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Characteristic acrylic (or sharp fragrant) and slightly nauseating sharp ester type

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister, supplied mask and escape respirator; gloves
5.2 **Symptoms Following Exposure:** May cause irritation and burning to eyes and skin. Exposure to vapor at concentrations greater than 25 ppm may be accompanied by nausea, headache, and irritation of eyes, nose, and throat.
5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air and administer artificial respiration if necessary. SKIN AND EYES: Wash with copious quantities of water. Get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** Not available
5.6 **Toxicity by Ingestion:** Grade 2. LD_{50} (rat): 1.02 g/kg
5.7 **Late Toxicity:** Repeated exposure may develop sensitivity
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating to eyes, with lacrimation at 100 ppm; severe irritation at 1000 ppm. Irritation to nose and throat at moderate or high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the eyes and skin to a degree depending on duration of contact. Prolonged or repeated skin contact may cause dermatitis.
5.10 **Odor Threshold:** 0.00124 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 55°F (O.C.)
6.2 **Flammable Limits in Air:** 1.4% - 14.0% by volume
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors generated when heated
6.6 **Behavior in Fire:** Vapor travels along surface and is readily ignited. Material will polymerize and generate heat when exposed to fire.
6.7 **Ignition Temperature:** 721°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 4.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** May occur; exclude moisture; vent; avoid exposure to high temperatures; oxygen promotes polymerization
7.6 **Inhibitor of Polymerization:** 10-25 ppm monomethyl ether of hydroquinone

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 12 ppm/24 hrs/brine shrimp/TL_m
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 66% of theoretical in 5 days, freshwater, acclimated seed
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Division
245 Park Ave.
New York, N.Y. 10017
2. Dow Badische Co.
Williamsburg, Va. 23185
3. Rohm and Haas Co.
Independence Mall West
Philadelphia, Pa. 19105

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 99.5% 99.8%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Section (CG-446-3)

APOTU 7

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Toxicity	3
Liquid or Solid Irritant	2
Poison	0
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	4
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 100.12
13.3 **Boiling Point at 1 atm:** 99.4°C = 211°F = 372.5°K
13.4 **Freezing Point:** -71°C = -95.8°F = 202°K
13.5 **Critical Temperature:** 344°C = 650°F = 617°K
13.6 **Critical Pressure:** 444 psia = 30 atm = 3.0 MN/m²
13.7 **Specific Gravity:** 0.924 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 34 dynes/cm = 0.034 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.07
13.12 **Latent Heat of Vaporization:** 166 Btu/lb = 92.5 cal/g = 3.87 × 10⁵ J/kg
13.13 **Heat of Combustion:** -14,100 Btu/lb = -7830 cal/g = -32.8 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** -166 Btu/lb = -92.5 cal/g = -3.87 × 10⁵ J/kg

(continued on next page)

NOTES

REVISED 1978

EAL — ETHYL ALCOHOL

Common Synonyms
Ethanol
Alcohol
Grain alcohol
Denatured alcohol

Watery liquid | Colorless | Alcohol odor

Floats and mixes with water. Flammable. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
Move to fresh air.

LIQUID
Not harmful.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**

Alcohol	Fermentation alcohol
Cologne spirit	Grain alcohol
Denatured alcohol	Spirit
Ethanol	Spirits of wine

3.2 **Coast Guard Compatibility Classification.** Alcohol

3.3 **Chemical Formula:** C_2H_5OH

3.4 **IMCO/United Nations Numerical Designation** 3.2/1170

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild, rather pleasant, like wine or whiskey. (Denatured alcohol may be unpleasant.)

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** All purpose canister, safety goggles. Avoid contact with liquid and inhalation of vapors.

5.2 **Symptoms Following Exposure:** Irritation of eyes, nose and throat. Headache and drowsiness may occur. Liquid causes intoxication.

5.3 **Treatment for Exposure:** INHALATION: if breathing is affected, remove victim to fresh air, call physician, administer oxygen. Speed is of primary importance. EYES OR SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm

5.5 **Short-Term Inhalation Limits:** 5000 ppm for 15 min

5.6 **Toxicity by Ingestion:** Grade I. LD_{50} 5 to 15 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5.10 **Odor Threshold:** 10 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 55°F C.C., 64°F O.C.

6.2 **Flammable Limits in Air:** 3.3% - 19%

6.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, water spray, alcohol foam.

6.4 **Fire Extinguishing Agents Not to be Used.** None.

6.5 **Special Hazards of Combustion Products:** None.

6.6 **Behavior in Fire.** Not pertinent.

6.7 **Ignition Temperature** 689°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 3.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
250 ppm/6 hr goldfish lethal, fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):**
12% 5 days, 44.2% (theor.) 5 days
71.2% (theor.) 20 days

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1 Commercial Solvents Corp
245 Park Ave
New York, N.Y. 10017

2 National Distillers and Chemical Corp
U.S. Industrial Chemicals Co. Division
Tuscola, Ill. 61953

3 Publicker Industries Inc
1429 Walnut St
Philadelphia, Pa. 19102

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous (200 proof), 190 proof, specially denatured, completely denatured

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P Q R S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.**
Liquid

13.2 **Molecular Weight:** 46.07

13.3 **Boiling Point at 1 atm:**
172.9°F = 78.3°C = 351.5°K

13.4 **Freezing Point.**
−177°F = −114.6°C = 159°K

13.5 **Critical Temperature.**
469.6°F = 243.1°C = 516.3°K

13.6 **Critical Pressure**
926 psia = 63.0 atm = 6.38 MN/m

13.7 **Specific Gravity** 0.790 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.6

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.13

13.12 **Latent Heat of Vaporization**
369 Btu/lb = 200 cal/g = 8.37 × 10⁵ J/kg

13.13 **Heat of Combustion.** −11,570 Btu/lb
= 6425 cal/g = −268.8 × 10⁵ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** −99 Btu/lb
= −55 cal/g = −2.3 × 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

EAD ETHYLALUMINUM DICHLORIDE

Common Synonyms

EADC
Aluminum ethyl dichloride

Liquid heated Colorless to light yellow

IGNITES WHEN EXPOSED TO AIR Reacts violently with water Poisonous gas is produced on contact with water Freezing point is 90° F

Call fire department
Wear goggles and self contained breathing apparatus
Stop discharge if possible Keep people away
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

IGNITES WHEN EXPOSED TO AIR
Irritating gases are produced when heated
Extinguish with dry graphite, soda ash, lime or other inert powder
DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY CHEMICAL OR VAPORIZING LIQUID ON FIRE
DO NOT USE WATER ON ADJACENT FIRES

Exposure

CALL FOR MEDICAL AID

GAS PRODUCED IN REACTION WITH WATER
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID (HEATED)
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, corrosive
Restrict access
Evacuate area

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Aluminum ethyl dichloride
EADC

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula.** $C_2H_5AlCl_2$

3.4 **IMCO/United Nations Numerical Designation:** 4.2/1924

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless to light amber, yellow

4.3 **Odor:** Not pertinent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protective clothing, preferably of aluminized glass cloth, goggles, face shield, gloves; in case of fire, all purpose canister or self contained breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation of smoke from fire causes metal fume fever (flu like symptoms); acid fumes irritate nose and throat. Contact with liquid (which is spontaneously flammable) causes severe burns of eyes and skin

5.3 **Treatment for Exposure:** INHALATION: only fumes from fire need be considered; metal fume fever is not critical and lasts less than 36 hrs; irritation of nose and throat by acid vapors may require treatment by a physician. EYES: flush gently with water for 15 min.; treat burns if fire occurred; get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Metal fume fever can develop after breathing smoke from fire

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point.** Not pertinent (ignites spontaneously)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Dry chemical, inert dry powders such as sand, limestone

6.4 **Fire Extinguishing Agents Not to be Used** Water, foam, halogenated agents, or carbon dioxide

6.5 **Special Hazards of Combustion Products** Intense smoke may cause metal fume fever. Irritating hydrogen chloride also formed

6.6 **Behavior in Fire:** Contact with water applied to adjacent fires will cause formation of irritating smoke containing aluminum oxide and hydrogen chloride

5.7 **Ignition Temperature:** Ignites spontaneously in air at ambient temperature

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride fumes and flammable ethane gas

7.2 **Reactivity with Common Materials** Reacts with surface moisture to generate hydrogen chloride which is corrosive to common metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** None

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Ethyl Corporation
Industrial Chemicals Division
Ethyl Tower
451 Florida
Baton Rouge, La. 70801

2 Texas Alkyls, Incorporated
P. O. Box 600
Deer Park, Texas 77536

3 Ventron Corp.
Alfa Products
P. O. Box 159
Beverly, Mass. 01915

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure (neat) 25% or less by weight in benzene, hexane or heptane. Solutions are not pyrophoric

10.2 **Storage Temperature:** 35 - 40 C

10.3 **Inert Atmosphere:** Inerted dry nitrogen at 5 psig

10.4 **Venting** Safety relief with rupture disc

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

VO/

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	3
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 130.9

13.3 **Boiling Point at 1 atm**
383°F = 194°C = 467°K

13.4 **Freezing Point.** 90 F = 32 C = 305 K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** 1.227 at 35°C (liquid)

13.8 **Liquid Surface Tension.** (est.)
30 dynes/cm = 0.030 N/m at 35 C

13.9 **Liquid-Water Interfacial Tension.**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization.**
Not pertinent

13.13 **Heat of Combustion** (est.) = -5,600 Btu/lb = -3,100 cal/g = -130 × 10 J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

EAS ETHYLALUMINUM SESQUICHLORIDE

Common Synonyms	
EASC	Liquid Colorless to yellow IGNITES WHEN EXPOSED TO AIR Reacts violently with water Poisonous and flammable gases are produced on contact with water

Call fire department
Wear goggles self contained breathing apparatus and rubber overclothing (including gloves)
Stop discharge if possible Keep people away
Isolate to remove discharged material
Notify local health and pollution control agencies

Fire

IGNITES WHEN EXPOSED TO AIR
If in water, let fire burn
If not in water extinguish with dry graphite, soda ash, or other inert powder
DO NOT USE WATER FOAM CARBON DIOXIDE DRY CHEMICALS OR VAPORIZING LIQUIDS ON FIRE
DO NOT USE WATER ON ADJACENT FIRES

Exposure

Call for medical aid

VAPOR
Irritating to eyes nose and throat
Harmful if inhaled
Move victim to fresh air
If breathing is difficult give oxygen

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

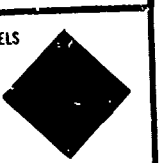
1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability corrosive
Restrict access
Evacuate area

2. LABELS





3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** TASC
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula.** $(C_2H_5)_3Al_2Cl_3$
3 4 **IMCO/United Nations Numerical Designation:** 4 2 1928

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Yellow colorless
4 3 **Odor:** Not pertinent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Full protective clothing preferably of aluminized glass cloth goggles faceshield gloves in case of fire all purpose canister or self contained breathing apparatus

5 2 **Symptoms Following Exposure:** Inhalation of smoke from fire causes metal fume fever (flu like symptoms) acid fumes irritate nose and throat Contact with liquid which is spontaneously flammable causes severe burns of eyes and skin

5 3 **Treatment for Exposure** INHALATION only fumes from fire need be considered metal fume fever is not critical and lasts less than 36 hr irritation of nose and throat by acid vapors may require treatment by a physician EYES flush gently with water for 15 min Treat burns of fire occurred seek medical attention SKIN wash with water treat burns caused by fire get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Metal fume fever may develop after breathing smoke from fire
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third degree burns on short contact and is very injurious to the eyes
5 10 **Odor Threshold** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (ignites spontaneously)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents** Dry chemical inert dry powders such as sand or limestone
6 4 **Fire Extinguishing Agents Not to be Used** Water foam halogenated agents or carbon dioxide
6 5 **Special Hazards of Combustion Products** Intense smoke may cause metal fume fever Irritating hydrogen chloride also formed
6 6 **Behavior in Fire** Contact with water from adjacent fires will cause formation of irritating smoke containing aluminum oxide and hydrogen chloride
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently to form hydrogen chloride fumes and flammable ethane gas
7 2 **Reactivity with Common Materials:** Reacts with surface moisture to generate hydrogen chloride which is corrosive to common metals
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Rinse with sodium bicarbonate or lime solution
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Ethyl Corporation
Industrial Chemicals Division
Ethyl Tower
451 Florida
Baton Rouge La 70801

2 Texas Alkyls Incorporated
P O Box 600
Deer Park Texas 77536

3 Ventron Corp
Alfa Products
P O Box 159
Beverly Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure (neat) 25% or less by weight in benzene hexane or heptane Solutions are not pyrophoric
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** Inerted dry nitrogen at 5 psig
10 4 **Venting:** Safety relief with rupture disc

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VO/

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	4
Reactivity (Yellow)	3
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight** 247 3
13 3 **Boiling Point at 1 atm** 399°F = 204 C = 477°K
13 4 **Freezing Point.** -4°F = -20°C = 253 K
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity.** 1 092 at 25 C (liquid)
13 8 **Liquid Surface Tension** (est) 32 dynes cm = 0 032 N m at 20 C
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** (est) = -8 660 Btu lb = -4 810 cal g = -20 0 × 10 J kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

EAM

ETHYLAMINE

Common Synonyms

Aminoethane
Monoethylamine

Liquid Colorless Strong ammonia like odor

Mixes with water. Boiling point is 62°F. Flammable, irritating vapor is produced

Shut off ignition sources. Call fire department.
Stop discharge if possible.
Evacuate area in case of large discharge.
Stay upwind. Use water spray to knock down vapor.
Dike and recover discharged material.
Notify local health and water pollution control agencies.

Fire

FLAMMABLE
Irritating gases are produced when heated.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemicals, alcohol foam, carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.
Move victim to fresh air.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

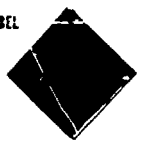
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability and contaminant, water contaminant.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Aminoethane; Monoethylamine
3 2 **Coast Guard Compatibility Classification.** Amines (4)
3 3 **Chemical Formula:** $C_2H_5NH_2$
3 4 **IMCO/United Nations Numerical Designation:** 2 1036

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Pungent, strong ammoniacal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Amine type or ammonia type mask, plastic gloves, face shield and goggles.
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract and lungs, pulmonary edema may result. Liquid causes severe irritation and burns of eyes and skin, and can permanently injure eyes after 4 seconds contact. Ingestion causes severe burns of mouth and stomach, can be fatal.
5 3 **Treatment for Exposure.** Get prompt medical attention for anyone overcome or injured by exposure to this compound. INHALATION: remove victim to fresh air, keep him warm and administer oxygen until medical help arrives. EYES: wash for 15 min with water, avoid pressure on eyelids. SKIN: wash with soap and water, dry, use ointments for at least 24 hrs, do not cover burned area with dry clothing, keep moist with physiological saline solution. INGESTION: if victim is conscious, give large amount of water, then induce vomiting.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm
5 5 **Short-Term Inhalation Limits:** 2 ppm for 30 min
5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 400 mg/kg (rat)
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure.
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 0°F, O C
6 2 **Flammable Limits in Air:** 3.5%–14%
6 3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Irritating and toxic oxides of nitrogen may be formed
6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Containers may explode when heated.
6 7 **Ignition Temperature:** 724°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 3.0 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Will strip and dissolve paint, dissolves most plastic materials, can cause swelling of rubber by absorption. The reactions are not hazardous.
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** 40 ppm, 24 hr, shub, 11 mi, fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Virginia Chemicals Inc.
3340 West Norfolk Road
Portsmouth, Va. 23703

2 Pennwalt Corporation
Three Parkway
Philadelphia, Pa. 19102

3 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Anhydrous (98.5–99.7%), 70–72% in water
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C K I-M N

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	3
Self Reaction	0

12 3 **NFPA hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 45.1
13 3 **Boiling Point at 1 atm:** 61.7°F = 16.5°C = 289.7°K
13 4 **Freezing Point:** −114°F = −81°C = 192°K
13 5 **Critical Temperature.** 361°F = 183°C = 456°K
13 6 **Critical Pressure:** 827 psia = 56.2 atm = 5.70 MN/m²
13 7 **Specific Gravity:** 0.687 at 15°C (liquid)
13 8 **Liquid Surface Tension** 20.5 dynes/cm = 0.0205 N/m at 15°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 1.5
13 11 **Ratio of Specific Heats of Vapor (Gas).** 1.1181
13 12 **Latent Heat of Vaporization** 253 Btu/lb = 146 cal/g = 6.11 × 10⁵ J/kg
13 13 **Heat of Combustion:** −16,180 Btu/lb = −9,990 cal/g = −376 × 10⁵ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Data not available
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ETB — ETHYLBENZENE

Common Synonyms
Phenylethane
EB

Liquid | Colorless | Sweet, gasoline-like odor

Floats on water. Flammable, irritating vapor is produced.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber protective clothing (including gloves).
Shut off ignition sources and all fire department.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus and rubber protective clothing (including gloves).
Extinguish with dry chemical, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

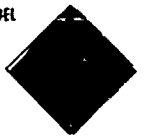
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** EB
Phenylethane

3.2 **Coast Guard Compatibility Classification:**
Aromatic hydrocarbon

3.3 **Chemical Formula:** $C_6H_5C_2H_5$

3.4 **IMCO, United Nations Numerical Designation** 3.1, 1175

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, safety goggles.

5.2 **Symptoms Following Exposure:** Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.

5.3 **Treatment for Exposure:** INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5.5 **Short-Term Inhalation Limits:** 200 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** 140 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 80°F (O.C.), 59°F (C.C.)

6.2 **Flammable Limits in Air:**
1.0% - 6.7%

6.3 **Fire Extinguishing Agents:** Foam (most effective), water for carbon dioxide or dry chemical.

6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent.

6.5 **Special Hazards of Combustion Products:**
Irritating vapors are generated when heated.

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.

6.7 **Ignition Temperature:** 810°F

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** 5.8 mm/min.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization:**
Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
29 ppm/96 hr/bluegill/11 m/fresh water

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD)**
2.8% (theor.), 5 days

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1. Amoco Chemicals Corp.
130 East Randolph Drive
Chicago, Ill. 60601
2. Dow Chemical Co.
Midland, Mich. 48640
3. Monsanto Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10.1 **Grades of Purity**
Research grade 99.98%, pure grade 99.5%, technical grade 99.0%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-1 U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight.** 106.17

13.3 **Boiling Point at 1 atm.**
277.2°F = 136.2°C = 409.4°K

13.4 **Freezing Point**
−139°F = −95°C = 178°K

13.5 **Critical Temperature:**
651.0°F = 343.9°C = 617.1°K

13.6 **Critical Pressure**
523 psia = 35.6 atm = 3.61 MN/m²

13.7 **Specific Gravity:** 0.867 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
29.2 dynes/cm = 0.0292 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
35.48 dynes/cm = 0.03548 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.071

13.12 **Latent Heat of Vaporization**
144 Btu/lb = 80 Cal/g = 3.35 × 10⁵ J/kg

13.13 **Heat of Combustion:** −17,780 Btu/lb = −9877 cal/g = −413.5 × 10³ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

REVISED 1978

EBT — ETHYL BUTANOL

Common Synonyms
Pseudobexyl alcohol
sec-Pentylcarbinol

Liquid | Colorless | Mild alcohol odor

Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical foam or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn eyes
Harmful if swallowed
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2 Ethyl 1 butanol
2 Ethylbutyl alcohol
sec Hexyl alcohol
sec Pentylcarbinol
Pseudohexyl alcohol

3 2 **Coast Guard Compatibility Classification.** Alcohol

3 3 **Chemical Formula:** $C_2H_5CHCH_3OH$

3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color** Colorless

4 3 **Odor** Mild and nonresidual

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Fresh air mask plastic gloves coveralls goggles safety shower and eye bath

5 2 **Symptoms Following Exposure:** Liquid causes eye burns Vapors may be mildly irritating to nose and throat

5 3 **Treatment for Exposure** Remove to fresh air Remove contaminated clothing Wash affected skin areas with water Flush eyes with water for at least 15 min and get medical care

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 - 5.0 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Irritates eyes moderate irritation of skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 128°F (O C)

6 2 **Flammable Limits in Air:** 1.7% - 9.8%

6 3 **Fire Extinguishing Agents.** Carbon dioxide or dry chemical for small fires alcohol foam for large fires

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 780°F (Calc.)

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A I-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 102.17

13 3 **Boiling Point at 1 atm**
293°F = 146°C = 419°K

13 4 **Freezing Point.**
−173°F = −114°C = 159°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.834 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
24.3 dynes/cm = 0.0243 N/m at 25°C

13 9 **Liquid-Water Interfacial Tension:**
(est.) 40 dynes/cm = 0.04 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** 136 Btu/lb = 108.9 cal/g = 4.550 × 10^5 J/kg

13 13 **Heat of Combustion** (est.) −16,400 Btu/lb = −9,240 cal/g = −38.7 × 10^5 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page Sand A

NOTES

EBR

ETHYL BUTYRATE

Common Synonyms
Ethyl butanoate
Butyric acid ethyl ester
Butyric ether

Liquid | Colorless | Fruity odor

Floats on water

Shut off ignition sources. Call fire department.
Avoid contact with liquid and vapor. Keep people away.
Stop discharge if possible.
Stay upwind. Use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemicals, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause headache or dizziness.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea, vomiting, dizziness or headache.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

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1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Restrict access.
Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Butyric acid ethyl ester; Butyric ether; Ethyl butanoate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $CH_3CH_2CH_2COOC_2H_5$
3.4 **IMCO/United Nations Numerical Designation:** 3.3 1180

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like apple or pineapple

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** All purpose canister mask or chemical cartridge respirator; glass or face shield; rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, dizziness, nausea, vomiting, and narcosis. Contact with liquid irritates eyes.
5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air and call a physician; give artificial respiration if necessary. INGESTION: induce vomiting and call a physician. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1; oral LD_{50} > 13 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** 0.015 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 84°F C.C., 75°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode in fire.
6.7 **Ignition Temperature:** 865°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 4.72 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May attack some forms of plastics
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Fritzsche Dodge and Olcott Inc.
76 Ninth Avenue
New York, N.Y. 10011
2. Northwestern Chemical Co.
120 N. Aurora St.
West Chicago, Ill. 60185
3. Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial 98+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 116.16
13.3 **Boiling Point at 1 atm:** 250°F = 121°C = 394°K
13.4 **Freezing Point:** −135°F = −93°C = 180°K
13.5 **Critical Temperature:** 559°F = 293°C = 566°K
13.6 **Critical Pressure:** 460 psia = 31 atm = 3.2 MN/m²
13.7 **Specific Gravity:** 0.879 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 4.0
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 128 Btu/lb = 71 cal/g = 3.6 × 10⁵ J/kg
13.13 **Heat of Combustion:** −13 200 Btu/lb = −7330 cal/g = −306 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

ECL — ETHYL CHLORIDE

Common Synonyms
Chloroethane
Ether hydrochloric

Liquid | Colorless | Pleasant odor

Floats and may boil on water. Flammable. Irritating vapor is produced. Boiling point is 54° F.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid.
Stay up wind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Stop flow of gas or liquid if possible.
Cool exposed containers and men effecting shutoff with water.
Let fire burn.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Will cause frostbite.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
DO NOT RUB AFFECTED AREAS.

Water Pollution

Not harmful to aquatic life.
May be dangerous if it enters water intakes.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chloroethane; Monochloroethane
3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon
3.3 **Chemical Formula:** C_2H_5Cl
3.4 **IMCO/United Nations Numerical Designation:** 2.0 1037

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ethereal, pungent, ethereal ether like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Neoprene rubber clothing where liquid contact is likely; chemical worker's goggles; RESPIRATORY PROTECTION for 1000 ppm to 2% (or 1/2 hr or less): full face mask and organic vapor canister; for greater levels: self-contained breathing apparatus or equivalent.
5.2 **Symptoms Following Exposure:** Vapor causes drunkenness, anesthesia, possible lung injury. Liquid may cause frostbite on eyes and skin.
5.3 **Treatment for Exposure:** INHALATION: get person to fresh air, keep warm and quiet. Get medical attention. SKIN: treat frostbite.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Not pertinent.
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** −58°F C.C.
45°F O.C.
6.2 **Flammable Limits in Air:** 3.6% - 12%
6.3 **Fire Extinguishing Agents:** Water fog, carbon dioxide, dry chemical. For large fires it is best to allow material to burn while cooling surrounding equipment. Stop flow of ethyl chloride.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated in fires.
6.6 **Behavior in Fire:** Containers may explode.
6.7 **Ignition Temperature:** 966°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 3.8 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Ethyl Corp.
Industrial Chemicals Division
451 Florida
Baton Rouge, La. 70801
2. PPG Industries, Inc.
Industrial Chemical Division
Lake Charles, La. 70601

10 SHIPPING INFORMATION

10.1 **Grades of Purity:**
Technical 98 - 100%
USP 100%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-B-C-D-E-F-G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemical	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 64.52
13.3 **Boiling Point at 1 atm:**
54.0°F = 12.2°C = 285.4°K
13.4 **Freezing Point:**
−217°F = −136°C = 137°K
13.5 **Critical Temperature:**
369°F = 187.2°C = 460.4°K
13.6 **Critical Pressure:**
798 psia = 51.6 atm = 5.23 MN/m²
13.7 **Specific Gravity:** 0.908 at 12.2°C (liquid)
13.8 **Liquid Surface Tension:**
19.5 dynes/cm = 0.0195 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:**
test 140 dynes/cm = 0.04 N/m at 0°C
13.10 **Vapor (Gas) Specific Gravity:** 2.2
13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.15
13.12 **Latent Heat of Vaporization:**
163 Btu/lb = 90.6 cal/g = 3.79 × 10⁵ J/kg
13.13 **Heat of Combustion:** −5100 Btu/lb
= −5900 cal/g = −494.4 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

ECA

ETHYL CHLOROACETATE

Common Synonyms
Chloroacetic acid ethyl ester
Ethyl chloracetate
Ethyl chloroethanoate
Monochloroacetic acid ethyl ester
Monochloroethanoic acid ethyl ester

Liquid | Colorless to light brown | Irritating or fruity odor

Sinks in water. Irritating vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, or nausea
Move victim to fresh air
Treat symptomatically
LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
Remove contaminated clothing
Flush affected areas with plenty of water
IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED induce VOMITING as directed by medical personnel
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Chloroacetic acid, ethyl ester, Ethyl chloracetate, Ethyl chloroethanoate, Monochloroacetic acid ethyl ester, Monochloroethanoic acid ethyl ester
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $CH_2ClCOOC_2H_5$
3 4 **IMCO/United Nations Numerical Designation:** 3 1181

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless, light straw to tan
4 3 **Odor:** Extremely irritating, fruity, pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic canister mask, rubber gloves, chemical goggles
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane, headache and nausea. Contact with liquid causes extreme eye irritation and conjunctivitis, irritates skin if not removed at once. Ingestion causes irritation of mouth and stomach.
5 3 **Treatment for Exposure:** INHALATION remove patient to fresh air, get medical attention. EYES flush with copious quantities of water for at least 15 min, get medical attention if irritation persists. SKIN wash with soap and water. INGESTION give large amounts of water and induce vomiting, get medical attention.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4 LD_{50} <50 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 129 F (OC) 100 F (CC)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Water fog, foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Irritating toxic hydrogen chloride and phosgene may be generated in fires
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 2 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Very slow, not hazardous
7 2 **Reactivity with Common Materials:** Slow hydrolysis to acidic products will cause slow corrosion of common metals. No hazard involved
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Kay Fries Chemicals Inc
360 Lexington Avenue
New York, N Y 10017
2 Monsanto Company
Monsanto Industrial Chemicals
800 North Lindbergh Boulevard
St Louis, Mo 63166
3 Dow Chemical Co
Midland, Mich 48640

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99+ %
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X X X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 122.6
13 3 **Boiling Point at 1 atm.** 289 F = 143 C = 416°K
13 4 **Freezing Point:** −15°F = −26 C = 247 K
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.15 at 20°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20 C
13 9 **Liquid-Water Interfacial Tension.** (est.) 24 dynes/cm = 0.024 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** 4.3
13 11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13 12 **Latent Heat of Vaporization.** 188 Btu/lb = 105 cal/g = 3.6 × 10⁵ J/kg
13 13 **Heat of Combustion** = −7290 Btu/lb = −4028 cal/g = −168 × 10⁵ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 3 and 4

NOTES

ECF

ETHYL CHLOROFORMATE

Common Synonyms

Chloroformic acid ethyl ester
Ethyl chlorocarbonate

Liquid | Colorless to light yellow | Irritating odor

Reacts slowly with water. Irritating vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles, self-contained breathing apparatus and rubber [illegible]
Shut off ignition sources. Call fire department.
Stop discharge if possible.
Flush water area to reduce fire hazard.
Stay upwind. Use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus and rubber overclothing (under Fire Gear).
Extinguish with dry chemical, CO2, or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.
Irritating to eyes, nose and throat.
Move victim to fresh air.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive, high flammability, poison.
Restrict access.
Disperse and flush.

2. LABELS



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Chloroformic acid ethyl ester, Ethyl chlorocarbonate
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $C_3H_5ClO_2$
3 4 **IMCO/United Nations Numerical Designation.** 3 2 1182

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless to pale yellow
4 3 **Odor:** Irritating, sharp, like hydrochloric acid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air line mask, self-contained breathing apparatus or organic and acid canister mask, full protective clothing
5 2 **Symptoms Following Exposure:** Inhalation causes mucous membrane irritation, coughing and sneezing. Vapor causes severe lachrymation, liquid causes acid type burns of eyes and skin like those of hydrochloric acid. Ingestion causes severe burns of mouth and stomach.
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air, use artificial respiration if breathing has stopped, call a doctor. Keep victim quiet and administer oxygen if needed. EYES: flush with water for at least 15 min., see a doctor. SKIN: wash liberally with water for at least 15 min., then apply dilute solution of sodium bicarbonate or commercially prepared neutralizer. INGESTION: do NOT induce vomiting, give large amount of water, get medical attention.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 4, oral LD_{50}: 50 mg/kg (rats)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately [illegible] such that personnel will not usually tolerate moderate or high concentrations.
5 9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure.
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 82 F (O.C.), 61 F (C.C.)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Water, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products.** Toxic chlorine and phosgene gases may be formed in fires.
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 932 F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 2.6 mm/min.

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Slow reaction with water evolving hydrogen chloride (hydrochloric acid)
7 2 **Reactivity with Common Materials.** Slow evolution of hydrogen chloride from surface moisture reaction can cause some corrosion
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Stoer Chemical Corporation
Oil Division
581 Ayard Road
Muskegon, Mich. 49443

2 Chemetron Corporation
Chemicals Group
900 Seventh Avenue
New York, N.Y. 10019

3 FMC Corporation
Industrial Chemical Division
633 Third Avenue
New York, N.Y. 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 98+
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

VOXY

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	2
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	4
Reactivity (Yellow)	3

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight.** 108.5
13 3 **Boiling Point at 1 atm.** 201 F = 93 C = 367 K
13 4 **Freezing Point:** −14 F = −81 C = 192 K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.135 at 20°C (liquid)
13 8 **Liquid Surface Tension.** 27.5 dynes/cm = 0.0275 N/m at 15°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** 3.8
13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.1044
13 12 **Latent Heat of Vaporization** (est.) 140 Btu/lb = 78 cal/g = 3.4 × 10⁵ J/kg
13 13 **Heat of Combustion.** (est.) −6,900 Btu/lb = −3,800 cal/g = −160 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
3 16 **Heat of Polymerization:** Not pertinent

(Continued on page Card)

NOTES

ECS — ETHYLDICHLOROSILANE

Common Synonyms

Liquid | Colorless | Sharp, irritating odor

Reacts violently with water. Irritating gas is produced on contact with water.

Shut off reaction sources. Call fire department.
Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Water spray may be ineffective. Will react violently with water.
DO NOT USE WATER OR FOAM ON FIRE.

Exposure

Call for medical aid.

VAPOR
Irritating to eyes, nose and throat.
Move victim from area.
Breathing difficult: Give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim rinse mouth with water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

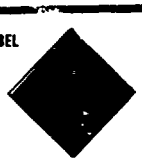
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4)

Issue warning: high flammability and toxicity
Restrict access.
Evacuate area.
Disperse and flush with water.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $C_2H_6Cl_2Si$
3 4 **IMCO/United Nations Numerical Designation:** 3 2 1183

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Sharp, hydrochloric acid-like

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Acid vapor type respirator. Protective rubber gloves, chemical worker's goggles, other equipment as necessary to protect skin and eyes.
5 2 **Symptoms Following Exposure:** Inhalation irritates mucous membranes. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.
5 3 **Treatment for Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove to fresh air, give artificial respiration if required. EYES: flush with water at least 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amounts of water, followed by milk or milk of magnesia.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3. LD$_{50}$: 50-500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5 9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 5°F OC
6 2 **Flammable Limits in Air:** 2% (LEL)
6 3 **Fire Extinguishing Agents:** Dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6 5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases may be formed.
6 6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride fumes and flammable hydrogen gas.
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 2 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously evolving hydrogen chloride (hydrochloric acid)
7 2 **Reactivity with Common Materials.** Reaction with surface moisture will generate hydrogen chloride which corrodes common metals.
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flood with water; rinse with sodium bicarbonate or lime solution.
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Dow Corning Corporation
P O Box 592
Midland, Mich 48640

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	1
Water Pollution	
Human Toxicants	1
Aquatic Toxicants	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	3
Self Reaction	1

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 129 1
13 3 **Boiling Point at 1 atm:** 165°F = 74°C = 347°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 092 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 21.2 dynes/cm = 0.0212 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 4 5
13 11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13 12 **Latent Heat of Vaporization:** (est.) 104 Btu/lb = 57.2 cal/g = 2.42 × 10^5 J/kg
13 13 **Heat of Combustion:** (est.) −6 580 Btu/lb = −3 650 cal/g = −150 × 10^5 J/kg
13 14 **Heat of Decomposition:** Not pertinent.
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 4 and 5

NOTES

ETL — ETHYLENE

Common Synonyms
Ethene
Olefiant gas

Liquefied compressed gas Colorless Sweet odor

Floats and boils on water. Flammable vapor cloud is produced.

What to Do in Case of Accident or Spill
Notify local health and pollution control agencies.
Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas.
Ventilate closed spaces before entering.
Keep combustibles away; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may be useful in controlling vapors.
Use water spray to protect personnel and to flush leaks to safe areas.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
May explode if ignited in an enclosed area.
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Not irritating to eyes, nose or throat.
If inhaled, will cause headache, dizziness or loss of consciousness.
[illegible]

LIQUID
Will cause frostbite.
[illegible]
DO NOT RUB AFFECTED AREAS.

Water Pollution

Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Initial Isolation: Spill/Flammability
Restriction: [illegible]
Evacuation: [illegible]

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethene; Olefiant gas
3.2 **Coast Guard Compatibility Classification:** Group 1
3.3 **Chemical Formula:** C_2H_4
3.4 **IMCO United Nations Numerical Designation:** 20 (compressed); 29 (liquefied)

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Colorless gas; liquefied gas
4.2 **Color:** Colorless
4.3 **Odor:** Slightly sweet odor; odor threshold

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Breathing apparatus; protective clothing
5.2 **Symptoms Following Exposure:** Moderate concentrations cause drowsiness, dizziness, and unconsciousness. Other symptoms: headache, nausea, vomiting, weakness
5.3 **Treatment for Exposure:** Remove victim to fresh air; if not breathing, give artificial respiration; keep warm and quiet; get medical attention
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is not irritating to eyes, nose or throat
5.9 **Liquid or Solid Irritant Characteristics:** Liquid may cause frostbite. Not irritating to skin
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** -221°F (Flammable gas)
6.2 **Flammable Limits in Air:** 2.7% - 36%
6.3 **Fire Extinguishing Agents:** Stop flow of gas if possible. Use water fog, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Vapors are anesthetic
6.6 **Behavior in Fire:** Container may explode
6.7 **Ignition Temperature:** 842°F
6.8 **Electrical Hazard:** Class I, Group C
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 22 ppm TLm/96 hr/sunfish/mod fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
   Houston, Tex. 77001
2. Phillips Petroleum Co
   Bartlesville, Okla. 74004
3. Union Carbide Corp
   Chemicals and Plastics Division
   270 Park Ave
   New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+%
10.2 **Storage Temperature:** Ambient (gas); -155°F (liquid)
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2
A B C D E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poison	
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	
Aesthetic Effect	0
Reactivity	
Other Chemicals	
Water	0
Self Reaction	2

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 28.05
13.3 **Boiling Point at 1 atm:** -154.7°F = -103.7°C = 169.5°K
13.4 **Freezing Point:** -272.4°F = -169.1°C = 104°K
13.5 **Critical Temperature:** 49.9°F = 9.9°C = 283.1°K
13.6 **Critical Pressure:** 742 psia = 50.5 atm = 5.1 MN/m²
13.7 **Specific Gravity:** 0.569 at -103.9°C (liquid)
13.8 **Liquid Surface Tension:** Dynes/cm = 0.0516 N/m at -103.9°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at -103.9°C
13.10 **Vapor (Gas) Specific Gravity:** 1.0
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.240
13.12 **Latent Heat of Vaporization:** 207.7 Btu/lb = 115.4 cal/g = 4.832 × 10⁵ J/kg
13.13 **Heat of Combustion:** 20,295 Btu/lb = 11,275 cal/g = 471.94 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

ECH — ETHYLENE CHLOROHYDRIN

Common Synonyms

2-Chloroethanol
2-Chloroethanol
2-Chloroethyl alcohol
Ethylene chlorohydrin
Glycol chlorohydrin

Liquid Colorless Faint sweet pleasant odor

Reacts with water (irritating vapor is produced)

Non-flammable liquid when not exposed to heat or flame
Use water spray, fog, or foam
Move container from fire area if this can be done without risk
Keep run-off water out of sewers and water sources
Dike for later disposal

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Fire-exposed containers should be cooled with water from unprotected locations

Exposure

Call a physician
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
Move victim to fresh air
Call a physician immediately
Administer artificial respiration if victim is not breathing
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing
Wash affected areas with plenty of water
IF IN EYES hold eyelids apart and flush with plenty of water for at least 15 minutes
IF SWALLOWED give plenty of water or MILK. Induce vomiting
Call a physician immediately
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Isolate and restrict water contamination
Restrict access
Dispose and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Chloroethanol
1-Chloro-2-hydroxyethane and 2-Chloroethyl alcohol
Ethylene chlorohydrin; Glycol chlorohydrin
3.2 **Coast Guard Compatibility Classification:** To be developed
3.3 **Chemical Formula:** C_2H_5ClO
3.4 **IMCO/United Nations Numerical Designation:** 1135

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Faint sweet

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister mask or self-contained breathing apparatus; goggles or face shield; rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of upper respiratory system; nausea, headache, delirium, coma, collapse. Liquid causes irritation of eyes and skin; prolonged contact with skin may allow penetration into body and cause same symptoms as following ingestion or inhalation. Ingestion causes nausea, headache, delirium, coma, and collapse
5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, give artificial respiration if breathing has stopped, call physician. EYES: flush with water for at least 15 minutes, get medical attention if irritation persists. SKIN: wash off with copious amounts of water, call physician if irritation has been prolonged. INGESTION: give large amounts of water or milk, induce vomiting, call physician immediately
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} 71 mg/kg (rats)
5.7 **Late Toxicity:** Damage to central nervous system and liver in humans
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** 140°F C.C.
6.2 **Flammable Limits in Air:** 4.9% - 15.9%
6.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Fumes, hydrogen chloride and phosgene when may be formed
6.6 **Behavior in Fire:** Vapors are heavier than air and may flash back a considerable distance to source of ignition
6.7 **Ignition Temperature:** 797°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)**
Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017
2. Platt and Baker Inc.
230 Old Northern Boulevard
Roslyn, N.Y. 11576
3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

YES

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poison Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 80.5
13.3 **Boiling Point at 1 atm:**
269.1°F = 131.7°C = 404.8°K
13.4 **Freezing Point:**
-84.7°F = -64.8°C = 208.4°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.203 at 20°C (liquid)
13.8 **Liquid Surface Tension:**
Data not available
13.9 **Liquid-Water Interfacial Tension:**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.8
13.11 **Ratio of Specific Heats of Vapor (Gas):**
Data not available
13.12 **Latent Heat of Vaporization:** 225 Btu/lb
= 125 cal/g = 5.3 × 10⁵ J/kg
13.13 **Heat of Combustion:** -645 Btu/lb
= -1.4 kcal/g = -59.3 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

ETC ETHYLENE CYANOHYDRIN

Common Synonyms
Hydracrylonitrile
2-Cyanoethanol
Glycol cyanohydrin
3-Hydroxypropanenitrile

Liquid Colorless to yellow-brown Weak odor to odorless

Sinks and mixes with water

Stop discharge if possible
Call fire department
Avoid contact and contamination of the harmful material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Wear self-contained breathing apparatus
Extinguish with dry chemical, alcohol foam, carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: Hold eyelids open, flush with plenty of water
IF SWALLOWED and victim CONSCIOUS: Have victim drink water
Induce vomiting
IF SWALLOWED: Do not induce vomiting if victim CONSCIOUS OR HAVING CONVULSIONS
Keep victim warm and quiet

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-6

Dissolve and Flush

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Cyanoethanol
Glycol cyanohydrin
Hydracrylonitrile
2-Hydroxypropanenitrile
3-Hydroxypropanenitrile

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** HOCH$_2$CH$_2$CN

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to yellow-brown

4.3 **Odor:** Practically odorless characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear supplied-air mask, plastic gloves, rubber clothing, rubber boots, goggles

5.2 **Symptoms Following Exposure:** Liquid irritating to eyes and skin. Inhalation may cause irritation of nose and throat

5.3 **Treatment for Exposure:** INGESTION: induce vomiting as directed on label. EYES: wash with plenty of water for 15 minutes. SKIN: flush exposed area with plenty of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 3 Data Not Available

5.7 **Late Toxicity:** Ingestion of liquid may cause severe kidney damage

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically nonirritating to skin

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 265°F CC

6.2 **Flammable Limits in Air:** 2.7% to 22% by volume

6.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, foam, water spray, fog. Use water to keep fire exposed containers cool

6.4 **Fire Extinguishing Agents Not to be Used:** Water in straight stream may cause frothing

6.5 **Special Hazards of Combustion Products:** Toxic gases are generated when heated

6.6 **Behavior in Fire:** Decomposes, producing toxic gas

6.7 **Ignition Temperature:** 421°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

American Cyanamid Company
Organic Chemicals Department
30 Rockefeller Plaza
New York, N.Y. 10020

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-444

VPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poison	1
Acute Poisoning	
Human Toxicity	
Aquatic Toxicity	2
Aquatic Effect	1
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 71.08

13.3 **Boiling Point at 1 atm:**
445°F = 229°C = 502°K

13.4 **Freezing Point:**
-31.2°F = -35.2°C = 237.8°K

13.5 **Critical Temperature:**
842°F = 428°C = 701°K

13.6 **Critical Pressure:**
770 psia = 49 atm = 4.9 MN/m^2

13.7 **Specific Gravity:** 0.97 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

EDA — ETHYLENEDIAMINE

Common Synonyms
1,2-Diaminoethane
1,2-Ethanediamine

Liquid | Colorless | Mild ammonia odor

Floats and mixes with water. Irritating vapor is produced. Freezing point is 52°F.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with water, dry chemical, alcohol foam, or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Dilute and flush.

2 LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2-Diaminoethane; 1,2-Ethanediamine
3.2 **Coast Guard Compatibility Classification:** Aliphatic amine
3.3 **Chemical Formula:** $NH_2CH_2CH_2NH_2$
3.4 **IMCO/United Nations Numerical Designation:** NO 1604

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Strong ammoniacal odor; ammonia-like; mild and ammoniacal odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Full rubber protective clothing and gloves and boots; chemical worker's goggles; face shield where contact with liquid is likely. If necessary to enter closed area for 1-2 hr or less, wear full faced gas mask with canister approved by Bureau of Standards for use with ammonia.

5.2 **Symptoms Following Exposure.** High concentration of vapor burns eyes and irritates nose and throat. Liquid burns eyes and skin.

5.3 **Treatment for Exposure.** Get medical help immediately. INGESTION: drink large amounts of water or milk quickly; induce vomiting only if instructed by physician. EYES: flush immediately and thoroughly with flowing water for at least 15 min. SKIN: remove clothing and flush affected area with copious amounts of flowing water, then wash with soap and water; severe exposure may require showering.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** 10 ppm

5.5 **Short-Term Inhalation Limits.** 20 ppm for 5 min

5.6 **Toxicity by Ingestion.** Grade 2; LD50: 5 to 5 g/kg (oral, rat)

5.7 **Late Toxicity.** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Fairly severe skin irritant; may cause pain and second degree burns after a few minutes' contact.

5.10 **Odor Threshold:** 10 ppm

6. FIRE HAZARDS

6.1 **Flash Point.** 99°F (O.C.) 100°F (C.C.)
6.2 **Flammable Limits in Air:** 2.5% - 14.3%
6.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemicals, foam or water.
6.4 **Fire Extinguishing Agents Not to be Used.** Do not use water in case of drum or tank fires.
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
6.6 **Behavior in Fire.** Not pertinent.
6.7 **Ignition Temperature.** 716°F
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate.** 2.2 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Gives off heat but reaction is not hazardous.
7.2 **Reactivity with Common Materials.** No reaction.
7.3 **Stability During Transport.** Stable.
7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water.
7.5 **Polymerization.** Not pertinent.
7.6 **Inhibitor of Polymerization.** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** 60 ppm/24 hr/shubunkin/killed/fresh water
8.2 **Waterfowl Toxicity.** Data not available
8.3 **Biological Oxygen Demand (BOD).** 75% (theory) 5 days
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Michigan 48640
2. Jefferson Chemical Co., Inc.
3336 Richmond Ave.
Houston, Texas 77002
3. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity.** 98%+
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting.** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid
13.2 **Molecular Weight.** 60.10
13.3 **Boiling Point at 1 atm.** 243°F = 117°C = 390 K
13.4 **Freezing Point.** 51.8°F = 10.9°C = 284.2 K
13.5 **Critical Temperature.** 608°F = 320°C = 593 K
13.6 **Critical Pressure.** 941 psia = 64 atm = 6.4 MN/m²
13.7 **Specific Gravity.** 0.899 at 20°C (liquid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity.** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.082
13.12 **Latent Heat of Vaporization.** 288 Btu/lb = 160 cal/g = 6.70 × 10⁵ J/kg
13.13 **Heat of Combustion.** = -12,290 Btu/lb = -6840 cal/g = -286.0 × 10⁵ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution.** (est.) -9 Btu/lb = -5 cal/g = -0.2 × 10⁵ J/kg
13.16 **Heat of Polymerization.** Not pertinent

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NOTES

REVISED 1978

EDT — ETHYLENEDIAMINE TETRACETIC ACID

Common Synonyms
Versenic acid
Tetrine acid
Ethylenebis (iminodiacetic acid)
EDTA

Solid powder | White | Odorless

Floats on water

In fire and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning: water contaminant
Should be removed

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** EDTA Endrate
Ethylenebis(iminodiacetic acid)
Ethylenedinitrilotetraacetic acid
Tetrine acid Versenic acid

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula** $(HOOCCH_2)_2NCH_2CH_2N(CH_2COOH)_2$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color.** White
4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Data not available
5 2 **Symptoms Following Exposure** Data not available
5 3 **Treatment for Exposure** Data not available
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 1 LD50 to 1 g/kg (as sodium or calcium salt)
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 129 ppm/96 hr/catfish/tapwater
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** 1.7 5 days
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Ciba Geigy Corp
Geigy Industrial Chemicals Division
McIntosh Ala 36553

2 Dow Chemical Co
Midland Mich 48640

3 W R Grace & Co
Dewey & Almy Chemical Division
Cambridge Mass 02140

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Data not available
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classification** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Powder
13 2 **Molecular Weight** 164
13 3 **Boiling Point at 1 atm** Not pertinent
13 4 **Freezing Point** Data not available
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity** 0.86 at 20 C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas_a) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

EDB — ETHYLENE DIBROMIDE

Common Synonyms
1,2-Dibromoethane
Ethylene bromide

Liquid | Colorless | Sweet odor

Sinks in water. Poisonous vapor is produced.
Freezing point is 50° F.

Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES ARE PRODUCED WHEN HEATED
Wear goggles, self-contained breathing apparatus and rubber overclothing, including gloves.
Extinguish fires with water.

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat
May cause headache
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, do not induce VOMITING. Have victim drink water, milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify wildlife and fishery agencies.
Notify operators of public water supplies.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4.)

Should be removed.
Chemical and physical treatment.

2 LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Bromofume 1,2-Dibromoethane; Dibromoethane; Dowfume W-10; W-15; W-40; Ethylene bromide; Glycol dibromide
3.2 **Coast Guard Compatibility Classification.** Halogenated hydrocarbon
3.3 **Chemical Formula** $BrCH_2CH_2Br$
3.4 **IMCO United Nations Numerical Designation** 6.1/1605

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color.** Colorless
4.3 **Odor** Mildly sweet, like chloroform

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Canister-type mask or self-contained air mask, neoprene gloves, chemical-safety goggles
5.2 **Symptoms Following Exposure:** Local inflammation, blisters and ulcers on skin; irritation to lungs and bronchitis; injury to liver and kidneys; may be absorbed through skin
5.3 **Treatment for Exposure:** Remove from exposure. Remove contaminated clothing. Wash skin with soap and water. Flush eyes with plenty of water. Consult physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value).** 5 mg/m
5.5 **Short-Term Inhalation Limits:** 50 ppm for 5 min
5.6 **Toxicity by Ingestion** Grade 4. LD 50 to 500 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products:** Decomposition gases are toxic and irritating
6.6 **Behavior in Fire** Decomposes into toxic, irritating gases. Reacts with hot metals such as aluminum and magnesium
6.7 **Ignition Temperature** Not flammable
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 18 mg/l/48 hr bluegill/fresh water
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. Great Lakes Chemical Corp.
West Lafayette, Ind. 47906
3. PPG Industries, Inc.
Houston Chemical Co. Division
1 Gateway Center
Pittsburgh, Pa. 15222

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3.)

A.X

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** ORM-A
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 187.86
13.3 **Boiling Point at 1 atm.** 268°F = 131°C = 404 K
13.4 **Freezing Point.** 49.6°F = 9.8°C = 283.0 K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure.** Not pertinent
13.7 **Specific Gravity:** 2.180 at 20°C (liquid)
13.8 **Liquid Surface Tension** 38.78 dynes/cm = 0.03878 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 36.54 dynes/cm = 0.03654 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.09
13.12 **Latent Heat of Vaporization:** 52.1 Btu/lb = 45.6 cal/g = 1.91 × 10⁵ J/kg
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

REVISED 1978

EDC — ETHYLENE DICHLORIDE

Common Synonyms
1,2 Dichloroethane
Ethylene chloride
EDC

Liquid | Colorless | Sweet odor

Sinks in water. Flammable, irritating vapor is produced.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self contained breathing apparatus and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with dry chemical, CO2, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

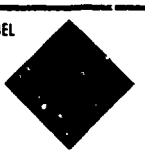
Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Isolate, warn of high flammability.
Disperse and flush.

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**

Bioxide	EDC
1,2 Dichloroethane	Ethylene chloride
Dutch liquid	Glycol dichloride

3 2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3 3 **Chemical Formula:** $ClCH_2CH_2Cl$

3 4 **IMCO United Nations Numerical Designation:** 1184

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor.** Ethereal, chloroform like, other like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Clean body covering clothing and safety glasses with side shields. Respiratory protection: up to 50 ppm, none; 50 ppm to 2%, 1/2 hr or less, full face mask and canister; greater than 2%, self contained breathing apparatus.

5 2 **Symptoms Following Exposure:** Inhalation of vapors causes nausea, drunkenness, depression. Contact of liquid with eyes may produce corneal injury. Prolonged contact with skin may cause a burn.

5 3 **Treatment for Exposure:** INHALATION: if victim is overcome, remove him to fresh air, keep him quiet and warm, and get medical attention immediately; if breathing stops, give artificial respiration. INGESTION: induce vomiting, call a physician, treat the symptoms. EYES: flush immediately with copious amounts of flowing water for at least 15 min. SKIN: remove clothing and wash skin thoroughly with soap and water, wash contaminated clothing before reuse.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm

5 5 **Short-Term Inhalation Limits:** 200 ppm for 5 min during any 3 hour period

5 6 **Toxicity by Ingestion:** Grade 2, LD50 0.5 to 5 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor may cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure.

5 10 **Odor Threshold:** 100 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 56°F (O.C.), 55°F (C.C.)

6 2 **Flammable Limits in Air:** 6.2% - 15.6%

6 3 **Fire Extinguishing Agents.** Foam, carbon dioxide, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Toxic and irritating gases (hydrogen chloride, phosgene) are generated.

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.

6 7 **Ignition Temperature:** 775°F

6 8 **Electrical Hazard:** Class I, Group D

6 9 **Burning Rate:** 1.6 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.**
150 ppm,* pumpkinseed; 11 ppm,* salt water
*Time period not specified

8 2 **Water Fowl Toxicity.**
Data not available

8 3 **Biological Oxygen Demand (BOD)**
0.002 lb/lb, 5 days

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Continental Oil Co
Conoco Chemicals Division
Park 80 Plaza East
Saddle Brook, N.J. 07662

2 Dow Chemical Co
Midland, Mich. 48640

3 Shell Chemical Co
Industrial Chemicals Division
Houston, Texas 77001

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure, vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

XX

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 98.96

13 3 **Boiling Point at 1 atm**
182.3°F = 83.5°C = 356.7°K

13 4 **Freezing Point**
= 32.0°F = 0.0°C = 273.2°K

13 5 **Critical Temperature**
550°F = 288°C = 561°K

13 6 **Critical Pressure**
738 psia = 50 atm = 5.1 MN/m²

13 7 **Specific Gravity:** 1.253 at 20°C (liquid)

13 8 **Liquid Surface Tension**
32.2 dynes/cm = 0.0322 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension**
(at 20°C) 40 dynes/cm = 0.040 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 3.4

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.115

13 12 **Latent Heat of Vaporization**
150 Btu/lb = 76.4 cal/g = 3.20 × 10⁵ J/kg

13 13 **Heat of Combustion.** (est.) 13400 Btu/lb = 1900 cal/g = 80 × 10⁵ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 2 and 3

NOTES

REVISED 1978

EGL	# ETHYLENE GLYCOL

Common Synonyms
Glycol
Monoethylene glycol
1,2-Ethanediol

Thick liquid | Colorless | Odorless

Sinks and mixes with water

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical alcohol foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
If swallowed, will cause loss of consciousness
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** 1,2-Dihydroxyethane; 1,2-Ethanediol; Ethylene dihydrate; Glycol; Monoethylene glycol

3.2 **Coast Guard Compatibility Classification:** Glycol

3.3 **Chemical Formula:** HOCH$_2$CH$_2$OH

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor.** Slight odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles, shower and eyebath

5.2 **Symptoms Following Exposure:** Inhalation of vapor is not hazardous. Ingestion causes stupor or coma, sometimes leading to fatal kidney injury

5.3 **Treatment for Exposure:** INGESTION: induce vomiting and call a physician. SKIN AND EYES: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 1. LD$_{50}$: 5.9 g/kg (rats; guinea pigs; mouse)

5.7 **Late Toxicity:** Late toxic injury may result if ingested

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard; practically harmless to the skin

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 240°F (CC) 232°F (CC)

6.2 **Flammable Limits in Air**
LEL = 3.2% UEL not listed

6.3 **Fire Extinguishing Agents** Water fog, alcohol foam, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** 775°F

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** 1.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
> 100 ppm/48 hr shrimp/LC$_{50}$/salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
42% (theor.) 5 days, 78% (theor.) 20 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co
Midland, Mich. 48640
2. PPG Industries, Inc.
Chemical Division
Guayanilla, Puerto Rico 00656
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Industrial grade; low conductivity grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

APQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

*12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemical	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight.** 62.07

13.3 **Boiling Point at 1 atm:**
387.7°F = 197.6°C = 470.8°K

13.4 **Freezing Point** 9.5°F = −12.8°C = 260.4°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** 1.115 at 20°C (liquid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.095

13.12 **Latent Heat of Vaporization:**
344 Btu/lb = 191 cal/g = 8.00 × 10^5 J/kg

13.13 **Heat of Combustion** −7259 Btu/lb = −4032 cal/g = −168.9 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) −20 Btu/lb = −12 cal/g = −0.8 × 10^5 J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

EGY ETHYLENE GLYCOL DIACETATE

Common Synonyms

Ethylene acetate
Glycol diacetate
Ethylene diacetate

Liquid | Colorless | Weak fruity odor

Sinks and mixes with water

[illegible]

Fire

Combustible

[illegible]

Exposure

[illegible]

LIQUID

Irritating to skin and eyes

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ethylene acetate, Ethylene diacetate, Glycol diacetate

3 2 **Coast Guard Compatibility Classification.** Esters (13)

3 3 **Chemical Formula:** $CH_3COOCH_2CH_2OCOCH_3$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Weak fruity

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation is not hazardous. Liquid causes mild irritation of eyes. Ingestion causes stupor or coma.

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES and SKIN: flush well with water. INGESTION: induce vomiting, call a physician.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 1; oral LD_{50} = 6,860 mg/kg (rat)

5 7 **Late Toxicity:** Ingestion may cause severe injury to kidney

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 205°F O.C., 191°F C.C.

6 2 **Flammable Limits in Air:** 1.6 v. 8.4

6 3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical, or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 5 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature:** 900°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate.** 3.9 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2 Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662

3 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XPQ

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	-
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 146.1

13 3 **Boiling Point at 1 atm:** 375.6°F = 190.9°C = 464.1 K

13 4 **Freezing Point.** −42.7°F = −41.5°C = 231.7 K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.104 at 20°C (liquid)

13 8 **Liquid Surface Tension** (est.) 20 dynes/cm = 0.020 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity.** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization** 133 Btu/lb = 74 cal/g = 3.1 × 10⁵ J/kg

13 13 **Heat of Combustion** (est.) −11,000 Btu/lb = −6,000 cal/g = −250 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

EEE ETHYLENE GLYCOL DIETHYL ETHER

Common Synonyms

Diethyl Cellosolve
1,2 Diethoxyethane

Liquid | Colorless | Mild pleasant odor

Floats and mixes slowly with water. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and evacuate spill or leak area immediately.
Notify local health and water pollution control officials.

Fire

Combustible.
Extinguish with dry chemical, alcohol foam, carbon dioxide.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID.

VAPOR

Irritating to eyes, nose and throat.
May cause central nervous system depression.

LIQUID

Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, do not induce VOMITING. Have victim drink water (one quart maximum) or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: water contaminant.
Disperse and flush.

2. LABELS

No label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diethyl Cellosolve; 1,2 Diethoxyethane

3.2 **Coast Guard Compatibility Classification:** Alcohols (6)

3.3 **Chemical Formula:** $C_2H_5OCH_2CH_2OC_2H_5$

3.4 **IMCO/United Nations Numerical Designation:** 33/1153

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Faint, ethereal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles or face shield; rubber gloves.

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with liquid irritates eyes but has little or no effect on skin. Ingestion causes irritation of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure. EYES: flush with water for at least 15 min. SKIN: wash with copious amounts of water. INGESTION: drink water and get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available.

5.5 **Short-Term Inhalation Limits:** Data not available.

5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 4 390 mg/kg (rat).

5.7 **Late Toxicity:** Data not available.

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available.

5.9 **Liquid or Solid Irritant Characteristics:** Data not available.

5.10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point:** 90°F, OC

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 406°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.1 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0.10 lb/lb, 10 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Eastern Chemical Division
230 Marcus Boulevard
Hauppauge, N.Y. 11787

2. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

VPQTT

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 118.2

13.3 **Boiling Point at 1 atm:** 252°F = 122°C = 395°K

13.4 **Freezing Point:** −70°F = −74°C = 199°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.8484 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 4.1

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0504

13.12 **Latent Heat of Vaporization:** 192 Btu/lb = 107 cal/g = 4.48 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) −13 100 Btu/lb = −8 100 cal/g = −340 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

EGD — ETHYLENE GLYCOL DIMETHYL ETHER

Common Synonyms
Monoglyme
1,2-Dimethoxyethane
Dimethyl Cellosolve
Ansul Ether 12

Liquid | Colorless | Fragrant odor

Floats and mixes with water. Irritating vapor is produced

Stop discharge if possible
Caution department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
If inhaled, will cause dizziness or difficult breathing
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Not irritating to skin
If swallowed, will cause nausea, vomiting or loss of consciousness
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Evacuate area if highly flammable
Dike as needed

2. LABELS

No hazard label required by Coast Guard Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Monoglyme, 1,2-Dimethoxyethane, Dimethyl Cellosolve, Ansul Ether 12
3 2 **Coast Guard Compatibility Classification:** Glycol ether
3 3 **Chemical Formula:** $CH_3OCH_2CH_2OCH_3$
3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Mild ethereal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Wear chemical safety goggles and rubber gloves
5 2 **Symptoms Following Exposure:** Data not available
5 3 **Treatment for Exposure:** INHALATION: Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Induce vomiting with Ipecac syrup
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade III. Single dose oral LD50 slightly toxic
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** None
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 104°F C.C.
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Containers may explode in fires
6 7 **Ignition Temperature:** 374°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Average

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Chemical Company
Chemical Division
Midland, Michigan 48640

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

Hazard Assessment Handbook, CG-446-3

VPQRS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 90.12
*13 3 **Boiling Point at 1 atm.:** 358.2°F = 181.2°C = 454.4°K
*13 4 **Freezing Point:** -74.2°F = -58.0°C = 215.2°K
*13 5 **Critical Temperature:** 381.2°F = 194°C = 467°K
*13 6 **Critical Pressure:** 568 psia = 38.7 atm = 3.92 MN/m²
13 7 **Specific Gravity:** 0.8683 at 20°C/4°C (liquid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 3.1
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.07
13 12 **Latent Heat of Vaporization:** 138 Btu/lb = 76.6 cal/gm = 321 kJ/kg
*13 13 **Heat of Combustion:** -12,930 Btu/lb = -7,183 cal/gm = -30,100 kJ/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

* Compared to water = 1.0

NOTES

REVISED 1978

EGM — ETHYLENE GLYCOL MONOBUTYL ETHER

Common Synonyms
2-Butoxyethanol
Butyl Cellosolve
Dowanol EB
Poly-Solv EB

Oily liquid | Colorless | Mild rancid odor

Floats and mixes with water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible.
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, Vol. 444.4

Disperse and flush

2 LABELS

No hazard label required by DOT
Coast Guard Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
2-Butoxyethanol | Ethylene Glycol Monobutyl Ether
Butyl Cellosolve | Poly-Solv EB
Dowanol EB

3.2 **Coast Guard Compatibility Classification**
Group 1

3.3 **Chemical Formula**
$C_4H_9OCH_2CH_2OH$

3.4 **IMCO United Nations Numerical Designation.** None

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild characteristic; slightly rancid; mild ethereal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air pack or organic canister respirator; rubber gloves; goggles; clothing to prevent body contact with liquid

5.2 **Symptoms Following Exposure:** Vapors irritate eyes and nose. Ingestion or skin contact causes headache, nausea, and vomiting

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air and call a physician. SKIN OR EYES: immediately flush with plenty of water for 15 minutes; get medical care for eyes

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 50 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD50 (oral, rat) 1.2 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Repeated or prolonged contact may cause mild irritation and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 165°F TOC, 155°F TCC

6.2 **Flammable Limits in Air:**
1.1 - 10.6%

6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol type foam for large fires

6.4 **Fire Extinguishing Agents Not to be Used**
Data not available

6.5 **Special Hazards of Combustion Products**
Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 472°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 6.7 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
1000 ppm/24 hr/brine shrimp/TL_m

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):**
26% of theoretical in 5 days, fresh water

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1. Jefferson Chemical Co.
1121 Richmond Ave.
Houston, Texas 77002
2. Union Carbide Corp.
Chemicals Division
Brandenburg, Ky. 40108
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open (chemical grade)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, Vol. 444.3

APQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poison	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 118.18

13.3 **Boiling Point at 1 atm.**
230.2°F = 110.1°C = 383.2°K

13.4 **Freezing Point:** -103°F = -75.5°C = 197.7°K

13.5 **Critical Temperature.**
490°F = 254.5°C = 527.6°K

13.6 **Critical Pressure:**
470 psia = 32.0 ATM = 3.24 MN/m²

13.7 **Specific Gravity:** 0.902 at 20°C (liquid)

13.8 **Liquid Surface Tension.** No pertinent

13.9 **Liquid-Water Interfacial Tension.**
No pertinent

13.10 **Vapor (Gas) Specific Gravity:**
No pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.07

13.12 **Latent Heat of Vaporization.**
172 Btu/lb = 95.6 cal/g = 400 J/kg

13.13 **Heat of Combustion:** 13,890 Btu/lb
= 7720 cal/g = 323 × 10³ J/kg

13.14 **Heat of Decomposition.** No pertinent

13.15 **Heat of Solution:** 103.9 Btu/lb
= 57.8 cal/g = 2.42 × 10³ J/kg

13.16 **Heat of Polymerization** No pertinent

Continued on next page

NOTES

REVISED 1978

EMA	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE

Common Synonyms

2-Butoxyethanol acetate
2-Butoxyethyl acetate
Glycol monobutyl ether acetate
Butyl "Cellosolve" acetate

Liquid | Colorless | Weak fruity odor

Floats and mixes slowly with water

[illegible] Keep [illegible]
Call for separation
Isolate and remove discharged material
[illegible]

Fire

Combustible
[illegible]

Exposure

[illegible]
LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Toxic to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Insoluble in water
Disperse and flush

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** 2-Butoxyethanol acetate, 2-Butoxyethyl acetate, Butyl Cellosolve acetate, Glycol monobutyl ether acetate

3.2 **Coast Guard Compatibility Classification:** Category D

3.3 **Chemical Formula:** $CH_3CH_2CH_2CH_2OCH_2CH_2OCCH_3$

3.4 **IMCO/United Nations Numerical Designation.** Not assigned

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Weak fruity

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may cause headache, nausea, dizziness. Liquid causes irritation of eyes and mucous membranes. Ingestion produces same symptoms as inhalation

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. EYES: flush with water for at least 15 min. SKIN: flush with water. INGESTION: induce vomiting, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Grade: Practically nontoxic, LD_{50} = 3.2 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 190°F (C.C.) 169°F (C.C.)

6.2 **Flammable Limits in Air:** 0.9% - 8.5%

6.3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 715°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.1 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 98%+

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

APQTT

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 160.21

13.3 **Boiling Point at 1 atm:**
378.0°F = 192.2°C = 465.4°K

13.4 **Freezing Point:**
-92.1°F = -63.5°C = 209.7°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.942 at 20°C (liquid)

13.8 **Liquid Surface Tension.** (est.)
26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent

13.12 **Latent Heat of Vaporization:** 94 Btu/lb
= 55 cal/g = 2.7 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) -14,000 Btu/lb
= -7,700 cal/g = -320 × 10⁵ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

EGE — ETHYLENE GLYCOL MONOETHYL ETHER

Common Synonyms
Poly-Sol EE
Dowanol EE
Cellosolve
Glycol monoethyl ether
2-Ethoxyethanol

Oily liquid | Colorless | Sweet odor

Floats and mixes with water

[illegible] discharge possible
[illegible] department
[illegible] with fish
[illegible] [illegible]

Fire

Combustible

[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Manual, CG-446-4

[illegible]

2. LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]
3.2 Coast Guard Compatibility Classification: [illegible]
3.3 Chemical Formula: HOCH2CH2OC2H5
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: [illegible]
4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: [illegible]
5.3 Treatment for Exposure: [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: [illegible]
5.6 Toxicity by Ingestion: [illegible]
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: 120°F OC, 202°F CC
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: [illegible]
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 455°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 2.4 mm/min

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): [illegible]
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades of Purity: Commercial
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: [illegible]
10.4 Venting: [illegible]

11. HAZARD ASSESSMENT CODE

[illegible]

NFQ

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combustible Liquid
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	2
Health	
Vapor Effect	
Liquid Splash Effect	
Poison	3
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	
Reactivity	
Chemical	2
Water	0
Self Reaction	0

12.3 NFPA Hazard Classifications: [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 90.12
13.3 Boiling Point at 1 atm.: 275°F, 135°C, 408°K
13.4 Freezing Point: Data not available
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 0.93 at 20°C/water
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Unknown
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: [illegible]
13.16 Heat of Polymerization: Not pertinent

[illegible]

NOTES

REVISED 1978

EGA — ETHYLENE GLYCOL MONOETHYL ETHER ACETATE

Common Synonyms
Poly-Sol® EE acetate
Cellosolve® acetate
2-Ethoxyethyl acetate

Liquid | Colorless | Pleasant odor

Floats and mixes slowly with water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible.
Extinguish with dry chemical, CO2, water spray, alcohol foam
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed.
Remove contaminated clothing and shoes
Quickly affected area with plenty of water
IF IN EYES, hold eyelids open, flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water
Induce vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Dispersal and dilute

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cellosolve acetate
2-Ethoxyethanol acetate
2-Ethoxyethyl acetate
Glycol monoethyl ether acetate
Poly-Sol® EE acetate

3.2 **Coast Guard Compatibility Classification:** Inert

3.3 **Chemical Formula:** $CH_3COOCH_2CH_2OC_2H_5$

3.4 **IMCO United Nations Numerical Designation:** 1172

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild pleasant ester-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles

5.2 **Symptoms Following Exposure:** Vapor causes irritation of eyes, nose and throat. Liquid causes severe eye damage. Repeated contact causes irritation

5.3 **Treatment for Exposure:** INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with plenty of water. Get medical attention. SKIN: Wash exposed area

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD_{50} = 5.5 g/kg orally

5.7 **Late Toxicity:** Causes kidney damage in laboratory animals. Effects unknown in humans

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes slight smarting of eyes and respiratory system if concentration is high. Irritation is not severe at 100 ppm

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. Repeated or prolonged contact may cause smarting and reddening of the skin

5.10 **Odor Threshold:** 0.036 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 124°F CC

6.2 **Flammable Limits in Air:** 1.7% - ?

6.3 **Fire Extinguishing Agents.** Alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 715°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 4000 ppm/24 hr/brine shrimp/TL$_m$

8.2 **Waterfowl Toxicity:** Data unavailable

8.3 **Biological Oxygen Demand (BOD)** 36% of theoretical in 5 days, freshwater

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Eastman Kodak
Texas Eastman Division
Longview, Texas 75601

Union Carbide Corp.
Chemicals and Plastics Div.
30 Park Ave.
New York, N.Y. 10017

Brandenburg Industries

Dow Chemical Co.

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open or pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

VPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Toxicity	1
Liquid Toxicity	1
Poison	
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 132.2

13.3 **Boiling Point at 1 atm:** 156.3°C = 313.3°F = 429.4°K

13.4 **Freezing Point:** -61.7°C = -79.1°F = 211.5°K

13.5 **Critical Temperature:** 379.2°C = 714.6°F = 652.4°K

13.6 **Critical Pressure:** 33.6 atm = 494 psia = 34.1 MN/m^2

13.7 **Specific Gravity:** 0.9742 at 20°C/4°C

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water: Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0

13.12 **Latent Heat of Vaporization:** 98 Btu/lb = 54.4 cal/g = 2.28 x 10^5 J/kg

13.13 **Heat of Combustion:** -8,100 Btu/lb = -4,500 cal/g = -188.3 x 10^5 J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Comments on page 2

NOTES

REVISED 1978

EME	ETHYLENE GLYCOL MONOMETHYL ETHER

Common Synonyms
Poly-Sol® EM
Dowanol EM
Methyl Cellosolve
Glycol monomethylether
2-Methoxyethanol

Liquid | Colorless | Odorless

Floats and mixes with water

No discharge if possible
Call fire department
Avoid contact with liquid
Evacuate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, alcohol foam, or water spray
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: Hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS: have victim drink water
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook [illegible]

Dike and [illegible]

2. LABELS

No [illegible]
Code 1 Poison B [illegible]

3. CHEMICAL DESIGNATIONS

3.1 Synonyms: Dow EM
Ethylene glycol monomethyl ether
2-Methoxyethanol
Methyl Cellosolve
Poly-Sol EM

3.2 Coast Guard Compatibility Classification: [illegible]

3.3 Chemical Formula: $CH_3OCH_2CH_2OH$

3.4 IMCO United Nations Numerical Designation: [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: [illegible]
4.3 Odor: Mild [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Chemical safety goggles; rubber gloves; [illegible]

5.2 Symptoms Following Exposure: Irritation of eyes, nose, throat; headache, nausea, vomiting, dizziness, drowsiness, [illegible]

5.3 Treatment for Exposure: SKIN OR EYES: Flush with plenty of water for [illegible]

5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm

5.5 Short-Term Inhalation Limits: No [illegible]

5.6 Toxicity by Ingestion: Grade 2; LD_{50} [illegible]

5.7 Late Toxicity: Causes blood disorders and damage to central nervous system in humans

5.8 Vapor (Gas) Irritant Characteristics: No [illegible]

5.9 Liquid or Solid Irritant Characteristics: Moderately irritating to eyes; prolonged or repeated skin contact may cause irritation and dermatitis of the skin

5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide or alcohol foam
6.4 Fire Extinguishing Agents Not to be Used: Not [illegible]
6.5 Special Hazards of Combustion Products: Not [illegible]
6.6 Behavior in Fire: Not [illegible]
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: Not [illegible]
6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No [illegible]
7.3 Stability During Transport: Not [illegible]
7.4 Neutralizing Agents for Acids and Caustics: Not [illegible]
7.5 Polymerization: Not [illegible]
7.6 Inhibitor of Polymerization: Not [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data [illegible]
8.2 Waterfowl Toxicity: Data [illegible]
8.3 Biological Oxygen Demand (BOD): [illegible]
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Jefferson Chemical Co., Inc.
1600 Richmond Ave.
Houston, Texas [illegible]

Olin Corp.
Chemical Div.
Brandenburg, Ky. [illegible]

Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 Grades of Purity: [illegible]
10.2 Storage Temperature: [illegible]
10.3 Inert Atmosphere: No [illegible]
10.4 Venting: [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook [illegible]

NRO

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
Combustible Liquid

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
[illegible]	
Health	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Flammability	
Reactivity	
Other Chemicals	
Water	
Self-Reaction	

12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: [illegible]
13.3 Boiling Point at 1 atm: [illegible]
13.4 Freezing Point: [illegible]
13.5 Critical Temperature: [illegible]
13.6 Critical Pressure: [illegible]
13.7 Specific Gravity: [illegible]
13.8 Liquid Surface Tension: [illegible]
13.9 Liquid-Water Interfacial Tension: [illegible]
13.10 Vapor (Gas) Specific Gravity: [illegible]
13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: 9460 Btu/lb = 4250 cal/g = 220 × 10^3 J/kg
13.14 Heat of Decomposition: [illegible]
13.15 Heat of Solution: Data not available
13.16 Heat of Polymerization: [illegible]

NOTES

REVISED 1976

ETI ETHYLENEIMINE

Common Synonyms
Aziridine

Oily liquid | Colorless | Ammonia odor

Floats and mixes with water. Poisonous flammable vapor is produced.

Fire

FLAMMABLE.
Containers may explode when heated.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes.

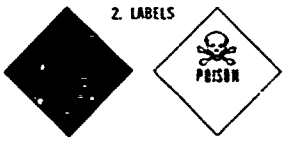
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula: C_2H_5N
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:

5.2 Symptoms Following Exposure:

5.3 Treatment for Exposure: INHALATION

5.4 Toxicity by Inhalation (Threshold Limit Value):

5.5 Short-Term Inhalation Limits:

5.6 Toxicity by Ingestion:

5.7 Late Toxicity: Causes cancer in mice. Effects on man unknown.

5.8 Vapor (Gas) Irritant Characteristics:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
Flammable liquid

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	
Health	
Liquid Solubility	
Poison	4
Water Pollution	
Human Toxicity	*
Aquatic Toxicity	
Tainting	
Reactivity	
Oxygen Demand	
Water	
Self Reaction	*

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard	*
Flammability	3
Reactivity (Oxidation)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

5 HEALTH HAZARDS (Cont'd)

5.9 Liquid or Solid Irritant Characteristics:

5.10 Odor Threshold:

REVISED 1978

EOX ETHYLENE OXIDE

Common Synonyms
Oxirane
1,2-Epoxyethane

Liquefied gas | Colorless | Sweet odor

Floats and mixes with water. Flammable, irritating vapor is produced. Boiling point is 51° F.

Avoid contact with liquid. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber protective clothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if it can be done without risk.
Stay upwind and keep out of low areas.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Containers may explode when heated
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles, self-contained breathing apparatus and rubber protective clothing (including gloves).
Stop flow of gas if possible.
Combat fire from behind barrier with maximum distance. Avoid direct contact.
Flood discharge area with water.
Cool exposed containers and protect cutoff effort by personnel with water.
Extinguish with alcohol foam, dry chemical, carbon dioxide water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, vomiting and difficult breathing
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, induce vomiting. DO NOT give liquids to an unconscious person.
If conscious, give large quantities of water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Actions Handbook CG-446-4)
Initial Isolation: 100 meters
Downwind: 0.1 mile

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** 1,2-Epoxyethane; Oxirane
3.2 **Coast Guard Compatibility Classification** Alkylene oxides
3.3 **Chemical Formula** C_2H_4O
3.4 **IMCO United Nations Numerical Designation** 2.0/1040

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless
4.3 **Odor:** Sweet characteristic ether like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Air-supplied mask, goggles or face shield, rubber shoes and coveralls.
5.2 **Symptoms Following Exposure** Exposure to low vapor concentrations often results in delayed nausea and vomiting. Higher concentrations produce irritation of eyes, nose and throat, high concentrations have caused pulmonary edema. Critical tissue is skin. Causes blistering on burns.
5.3 **Treatment for Exposure** INHALATION: Remove contaminated victim immediately to fresh air and administer oxygen if breathing is difficult. Call physician. SKIN OR EYES: flush immediately with plenty of water for 15 minutes and seek medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 50 ppm
5.5 **Short-Term Inhalation Limits** 500 ppm for 30 min
5.6 **Toxicity by Ingestion** Grade 3, oral rat LD_{50} = 33 g/kg
5.7 **Late Toxicity:** Causes cancer in mice. Effects on humans unknown
5.8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating such that personnel will not readily tolerate moderate concentrations.
5.9 **Liquid or Solid Irritant Characteristics** Liquid will cause severe irritation and may cause painful second degree burns after a few minutes contact.
5.10 **Odor Threshold** 50 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** < 0 F (O.C.)
6.2 **Flammable Limits in Air** 3.0 - 100%
6.3 **Fire Extinguishing Agents** Stop flow of gas. Use water, carbon dioxide, dry chemical or alcohol foam.
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Irritating vapors generated when heated.
6.6 **Behavior in Fire** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode when heated.
6.7 **Ignition Temperature** 804°F
6.8 **Electrical Hazard** Class I, Group B
6.9 **Burning Rate** 3.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Slow reaction, not hazardous
7.2 **Reactivity with Common Materials** Not pertinent
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** May polymerize violently if contaminated with alkaline or acidic materials and metal oxides or chlorides
7.6 **Inhibitor of Polymerization** None used

8. WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. Jefferson Chemical Co., Inc.
1336 Richmond Ave.
Houston, Texas 77002
3. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity.** Commercial 100. Must contain no acetylene.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere** Inerted
10.4 **Venting.** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3)
A B C K-E M N

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	3
Self Reaction	4

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	3

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Gas
13.2 **Molecular Weight.** 44.05
13.3 **Boiling Point at 1 atm**
51.3 F = 10.7 C = 283.9 K
13.4 **Freezing Point**
-170.3 F = -112.6 C = 160.6 K
13.5 **Critical Temperature**
385 F = 19.1 C = 464 K
13.6 **Critical Pressure**
1040 psia = 71.0 atm = 7.2 MN/m²
13.7 **Specific Gravity,** 0.869 @ 20 C (liquid)
13.8 **Liquid Surface Tension**
24.3 dynes/cm = 0.0243 N/m at 20 C
13.9 **Liquid-Water Interfacial Tension**
No pertinent
13.10 **Vapor (Gas) Specific Gravity** 1.5
13.11 **Ratio of Specific Heats of Vapor (Gas).**
1.212
13.12 **Latent Heat of Vaporization.** 242.3 Btu/lb
= 135 Cal/g = 5.709 × 10⁵ J/kg
13.13 **Heat of Combustion.** -11,430 Btu/lb
= -6380 Cal/g = -267 × 10⁵ J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** -61 Btu/lb
= -34 Cal/g = -1.4 × 10⁵ J/kg
13.16 **Heat of Polymerization** Not pertinent

Continued on next page.

NOTES

EFT ETHYL ETHER

Common Synonyms
Anesthetic ether
Sulfuric ether
Ether
Diethyl ether
Diethyl oxide

Watery liquid | Colorless | Sweet odor

Floats on water. Flammable, irritating vapor is produced. Boiling point is 94° F.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, or loss of consciousness.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**

Anesthesia ether	Ether
Diethyl ether	Ethoxyethane
Diethyl oxide	Sulfuric ether

3.2 **Coast Guard Compatibility Classification** Ether

3.3 **Chemical Formula** $C_4H_{10}O$

3.4 **IMCO United Nations Numerical Designation** 3.1 1155

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweet, pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Approved organic vapor canister mask, chemical goggles, synthetic rubber or plastic gloves

5.2 **Symptoms Following Exposure.** Vapor inhalation may cause headache, nausea, vomiting, and loss of consciousness. Contact with eyes will be irritating. Skin contact from clothing wet with the chemical may cause burns.

5.3 **Treatment for Exposure.** INHALATION: remove victim to fresh air; if breathing has stopped, apply artificial respiration; if breathing is difficult, give oxygen; call a physician. EYES: flush immediately with water for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 400 ppm

5.5 **Short Term Inhalation Limits** 1000 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} 0.5 to 5 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly.

5.10 **Odor Threshold** 0.83 ppm

6 FIRE HAZARDS

6.1 **Flash Point** −40 F (O.C.) −49 F (C.C.)

6.2 **Flammable Limits in Air**
1.85% - 36%

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide or foam

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire.** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Decomposes violently when heated.

6.7 **Ignition Temperature:** 356 F

6.8 **Electrical Hazard:** Class I, group C

6.9 **Burning Rate:** 0.7 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):** 1.5 g/g/day

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Exxon Chemical Co.
Houston, Texas 77001
2. Publicker Industries Inc.
1429 Walnut Street
Philadelphia, Pa. 19102
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, absolute, purified, anesthesia, USP, concentrated

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere** Inerted

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-T-U-V-W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	2
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 74.12

13.3 **Boiling Point at 1 atm**
94 °F = 34 °C = 307 °K

13.4 **Freezing Point**
−177.3 °F = −116 °C = 157.0 °K

13.5 **Critical Temperature**
380 °F = 193 °C = 466.7 °K

13.6 **Critical Pressure.**
527 psia = 35.9 atm = 3.64 MN/m²

13.7 **Specific Gravity** 0.714 @ 20 °C (liquid)

13.8 **Liquid Surface Tension**
17 dynes/cm = 0.017 N/m @ 20 °C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity.** 2.6

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.081

13.12 **Latent Heat of Vaporization** 155 Btu/lb = 84.9 cal/g = 3.55 × 10⁵ J/kg

13.13 **Heat of Combustion.** −14,580 Btu/lb = −8092 cal/g = −338.4 × 10⁵ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(See reverse page, Sample)

NOTES

REVISED 1978

EFM	# ETHYL FORMATE

Common Synonyms

Formic acid ethyl ester
Ethyl formic ester
Ethyl methanoate
Formic ether

Liquid | Colorless | Pleasant odor

Floats and mixes with water. Flammable. Irritating vapor is produced.

Shut off ignition sources. Call fire department.
Stop discharge if possible. Keep people away.
Stay upwind. Use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemicals, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

VAPOR

Irritating to eyes, nose and throat.
If inhaled will cause difficult breathing.

Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
If IN EYES, hold eyelids open and flush with plenty of water.
If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, water contaminant.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethyl formic ester, Ethyl methanoate, Formic acid ethyl ester, Formic ether

3.2 **Coast Guard Compatibility Classification:** Esters (13)

3.3 **Chemical Formula:** $HCOOC_2H_5$

3.4 **IMCO/United Nations Numerical Designation:** 3.1, 1190

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic pleasant aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister gas mask, goggles, face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation of vapor causes slight irritation of the eyes and rapidly increasing irritation of the nose. High concentrations cause deep narcosis within a few minutes, followed by death within a few hours. Contact with liquid causes moderate irritation of eyes and mild irritation of skin. Ingestion causes irritation of mouth and stomach, may cause deep narcosis and death if not treated.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure, begin artificial respiration if breathing has stopped, call physician. EYES: wash with water for 15 min., call physician if needed. SKIN: wash with water for 15 min., call physician if irritation persists. INGESTION: do NOT induce vomiting, get medical attention at once.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1,850 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effects are temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes' contact.

5.10 **Odor Threshold:** Data not available.

6. FIRE HAZARDS

6.1 **Flash Point:** 10°F (O.C.) = -4°F (C.C.)

6.2 **Flammable Limits in Air:** 2.8% - 16.0%

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapors heavier than air and may travel long distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 851°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.6 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 30% 10 days, 0.8 lb/lb 10 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Frutarom Dodge & Olcott Inc.
   76 Ninth Avenue
   New York, N.Y. 10001
2. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650
3. Aldrich Chemical Co.
   940 West St. Paul Avenue
   Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 95+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V P Q R-S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 74.1

13.3 **Boiling Point at 1 atm.**
129.6°F = 54.2°C = 327.4°K

13.4 **Freezing Point:**
-110°F = -79°C = 194°K

13.5 **Critical Temperature**
455°F = 235°C = 508°K

13.6 **Critical Pressure**
686 psia = 46.6 atm = 4.73 MN/m

13.7 **Specific Gravity:** 0.922 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** (est.)
28 dynes/cm = 0.028 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 2.6

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.014

13.12 **Latent Heat of Vaporization** 176 Btu/lb
= 98 cal/g = 4.1 × 10⁵ J/kg

13.13 **Heat of Combustion** -9,500 Btu/lb
= -5,300 cal/g = -220 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** -50 Btu/lb
= 28 cal/g = -1.2 × 10⁵ J/kg

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 1 and 4

NOTES

EHA ETHYLHEXALDEHYDE

Common Synonyms			
2-Ethylhexanal Butylethylacetaldehyde alpha-Ethylcaproaldehyde Octylaldehyde 2-Ethylhexaldehyde	Liquid	White	Mild odor
	Floats on water		

[illegible]

Fire

Combustible

[illegible]

Exposure

CAUTION MAY BE HARMFUL

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

[illegible]

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

[illegible]
IF IN EYES Hold eyelids open and flush with plenty of water
IF SWALLOWED [illegible] DO NOT INDUCE VOMITING
IF SWALLOWED and drowsy DO NOT INDUCE VOMITING [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** Butylethylacetaldehyde, 2-Ethylcaproaldehyde, 2-Ethylhexaldehyde, 2-Ethylhexanal, Octylaldehyde

3.2 **Coast Guard Compatibility Classification:** Aldehyde

3.3 **Chemical Formula.** $C_4H_9CH(C_2H_5)CHO$

3.4 **IMCO/United Nations Numerical Designation:** 3.3 1191

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Rubber gloves, safety goggles or face shield

5.2 **Symptoms Following Exposure:** Inhalation may be irritating to mucous membrane, overexposure may cause dizziness and collapse. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation

5.3 **Treatment for Exposure:** INHALATION remove victim to fresh air, give oxygen if breathing is difficult, call a doctor. EYES irrigate immediately for 15 min., then get medical attention. SKIN flush with water, wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Grade 2; oral rat LD_{50} = 3.730 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 127°F (OC), 112°F (CC)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products**

6.6 **Behavior in Fire**

6.7 **Ignition Temperature.** 487°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials.** May ignite spontaneously when spilled on clothing, paper or other absorbent materials

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662

2 Union Carbide Corp.
Chemicals and Plastics
270 Park Avenue
New York, N.Y. 10017

3 Pfaltz and Bauer, Inc.
375 Fairfield Ave.
Stamford, Conn. 06902

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 95.0+ %

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A.T.U.

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** 128.25

13.3 **Boiling Point at 1 atm** 327°F = 164°C = 437°K

13.4 **Freezing Point.** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.820 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** 164 Btu/lb = 91.2 cal/g = 3.82 × 10^5 J/kg

13.13 **Heat of Combustion** 15,860 Btu/lb = 8,810 cal/g = 369 × 10^5 J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 4 and 5

NOTES

EHX 2-ETHYL HEXANOL

Common Synonyms
2-Ethyl Hexanol
2-Ethylhexyl Alcohol

Oily liquid | Colorless | Faint odor

Floats on water

[illegible]

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** 2-Ethyl-1-hexanol
1-Ethylhexyl alcohol

3.2 **Coast Guard Compatibility Classification** Alcohol

3.3 **Chemical Formula:**

$CH_3(CH_2)_3CH(C_2H_5)CH_2OH$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** [illegible]

5.2 **Symptoms Following Exposure** Anesthetic, nausea, headache, dizziness, mild irritating to skin and eyes

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air. SKIN: wash affected area with water. EYES: flush with water for [illegible] get medical care.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5.5 **Short-Term Inhalation Limits.** Not pertinent

5.6 **Toxicity by Ingestion** Grade 2 LD_{50} 0.5 - 5 g/kg (rabbit, animals)

5.7 **Late Toxicity:** Increased excitability of central nervous system in rats and rabbits

5.8 **Vapor (Gas) Irritant Characteristics** Vapor is irritating to eyes, mucous membranes, respiratory system. Prolonged exposure to high concentrations may cause narcosis.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Repeated or prolonged contact may cause smarting and reddening of the skin.

5.10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6.1 **Flash Point.** 178°F OC, 178°F CC

6.2 **Flammable Limits in Air:**
Data not available

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products.**
Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature** 500°F

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** 4.0 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
19 ppm/24 hr/brine shrimp/TLM

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD)**
68% of theoretical in 5 days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662
2. Oxochem Enterprises
Penuelas, Puerto Rico 00724
3. Shell Chemical Co.
Industrial Chemicals Division
Houston, Texas 77001
4. Union Carbide Corp.
Chemical and Plastics Division
270 Park Avenue
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.9%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame (PRV)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

ATI

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight.** 130.23

13.3 **Boiling Point at 1 atm:**
365°F = 185°C = 458°K

13.4 **Freezing Point**
<-105°F = <-76°C = <197°K

13.5 **Critical Temperature**
711°F = 377°C = 650°K

13.6 **Critical Pressure**
412 psia = 28 atm = 2.8 MN/m²

13.7 **Specific Gravity:** 0.834 at 20°C/4°C

13.8 **Liquid Surface Tension:**
27.6 dynes/cm = 0.027 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
22 dynes/cm = 0.022 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization**
150 Btu/lb = 83 cal/g = 3.50 × 10⁵ J/kg

13.13 **Heat of Combustion** -17,480 Btu/lb
= -9710 cal/g = -4.06 × 10⁷ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(See reverse side)

NOTES

REVISED 1978

EAI 2-ETHYLHEXYL ACRYLATE, INHIBITED

Common Synonyms

Acrylic acid 2-ethylhexylester
2-Ethylhexyl 2-propenoate

Liquid | Colorless | Sharp odor

Floats on water

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Containers may explode in fire
Combat fires from safe distance. Use protected location.
Extinguish with dry chemicals, carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flood affected areas with plenty of water.
IF IN EYES: Hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Acrylic acid 2-ethylhexyl ester; 2-Ethylhexyl 2-propenoate

3.2 **Coast Guard Compatibility Classification.** Acrylate

3.3 **Chemical Formula.**
$CH_2{=}CHCOOCH_2CH(C_2H_5)C_4H_9$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp mild ester type inoffensive

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus; rubber gloves; vapor proof chemical safety goggles; impervious apron and boots.

5.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor causes drowsiness and convulsions. Liquid causes irritation of eyes and may irritate skin on prolonged exposure. Ingestion produces same symptoms as inhalation.

5.3 **Treatment for Exposure:** INHALATION: give artificial respiration and oxygen if necessary; call a physician. EYES: immediately flush with plenty of water for at least 15 min.; get medical attention. SKIN: immediately flush with plenty of water for at least 15 min. INGESTION: induce vomiting and consult a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion** Grade 2; oral rat LD_{50} = 1.540 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are not irritating to eyes and throat.

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** 198 F OC

6.2 **Flammable Limits in Air:** 0.8% - 6.4%

6.3 **Fire Extinguishing Agents** Dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire.** Heat can result in a severe polymerization with rapid release of energy. Sealed containers may rupture explosively if hot.

6.7 **Ignition Temperature.** 496 F

6.8 **Electrical Hazard.** Data not available

6.9 **Burning Rate.** 3.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization** Will polymerize in the absence of inhibitor and when heated

7.6 **Inhibitor of Polymerization:** Monomethyl ether of hydroquinone, 100 - 120 ppm
Hydroquinone 90 - 120 ppm

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 22 ppm 24 hr
Tank shrimp TL_m

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
97% of theoretical in 5 days, fresh water acclimated seed

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Celanese Chemical Company
245 Park Avenue
New York, N.Y. 10017

2 Rohm and Haas Co., Inc.
Independence Mall West
Philadelphia, Pa. 19105

3 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99%

10.2 **Storage Temperature:** <100 F (38 C)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U /

*2. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 184.2

13.3 **Boiling Point at 1 atm:** (polymerizes)
417°F = 214°C = 487°K

13.4 **Freezing Point.**
−130°F = −90°C = 183°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** 0.888 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.)
26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.)
30 dynes/cm = 0.030 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization.** 110 Btu/lb = 61 cal/g = 2.6 × 10⁵ J/kg

13.13 **Heat of Combustion.** −15,900 Btu/lb = −8,600 cal/g = −360 × 10⁵ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** 242 Btu/lb = −79 cal/g = −3.3 × 10⁵ J/kg

Continued on page 5 and 6

NOTES

EHT — ETHYL HEXYL TALLATE

Common Synonyms	Liquid	Light yellow	Mild odor
	Floats on water		

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam or carbon dioxide

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shorelines
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Crodac EH
3 2 **Coast Guard Compatibility Classification** Inert
3 3 **Chemical Formula** (Mixture)
3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow
4 3 **Odor:** Mild characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Data not available
5 2 **Symptoms Following Exposure:** Data not available
5 3 **Treatment for Exposure:** Data not available
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics.** None
5 10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 395°F OC
6 2 **Flammable Limits in Air**
Data not available
6 3 **Fire Extinguishing Agents** Data not available
6 4 **Fire Extinguishing Agents Not to be Used:**
Data not available
6 5 **Special Hazards of Combustion Products.**
Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.**
No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):**
Data not available
8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

Arizona Chemical Co
[illegible] Sixth St
New York, N Y 10020

2 Crodac Chemicals Inc
Peabody, Mass 01960

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG-446-2)

XTUXY

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm** Not known
13 4 **Freezing Point:** Not known
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** (est.) 0.95 at 20°C (liquid)
13 8 **Liquid Surface Tension.**
30.4 dynes/cm = 0.0304 N/m at 24°C
13 9 **Liquid-Water Interfacial Tension**
28 dynes/cm = 0.028 N/m at 21.3°C
13 10 **Vapor (Gas) Specific Gravity**
Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent
13 12 **Latent Heat of Vaporization**
Not pertinent
13 13 **Heat of Combustion.** [illegible]
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

ENB — ETHYLIDENENORBORNENE

Common Synonyms
5-Ethylidenebicyclo (2,2,1) hept-2-ene
Ethylidenenorcamphene
Ethylidenenorbornylene

Liquid | White | Turpentine like odor

Floats on water

[illegible]

Fire

Combustible

[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, coughing or difficult breathing

[illegible]

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
5-Ethylidene-bicyclo-(2,2,1)-hept-2-ene
Ethylidene-norbornene
Ethylidenenorcamphene

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula:** C_9H_{12}

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like turpentine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Organic canister mask; supplied mask; gasoline hose; solid rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation: Vapor causes headache, confusion and respiratory distress. Ingestion causes nausea and acute gastrointestinal distress. Contact causes severe pneumatic. Contact with liquid causes irritation to eyes and skin.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: give large amounts of water and induce vomiting; get medical attention immediately. EYES: flush with water for at least 5 min. SKIN: wipe off; wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Grade 2; oral LD_{50} = 2.5 g/kg (rats)

5.7 **Late Toxicity:** Causes kidney and liver damage in rabbits and rats at weights of rats

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If splashed on clothing and allowed to remain, may cause smarting and reddening of skin.

5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 96°F (O.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products.**

6.6 **Behavior in Fire**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard.** Data not available

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Data not available

7.6 **Inhibitor of Polymerization:** Data not available

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Avenue
New York, N.Y. 10017

2. Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

3. Pfaltz and Bauer, Inc.
375 Fairfield Ave.
Stamford, Conn. 06902

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99%+

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NFI

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	1
Self Reactive	1

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 120.2

13.3 **Boiling Point at 1 atm.** 293°F = 145°C = 418°K

13.4 **Freezing Point:** -112°F = -80°C = 193°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.950 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** 4

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Data not available

13.13 **Heat of Combustion** [illegible] = -18,900 BTU/lb = -10,450 cal/g = -437 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Data not available

[illegible]

NOTES

ELT — ETHYL LACTATE

Common Synonyms

ethyl α-ethoxyester
Ethyl 2-hydroxypropanoate
Ethyl 2-hydroxypropanoate

Liquid | Colorless | Mild odor

Mixes with water

Fire

Combustible

Exposure

LIQUID
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning / water-pollutant
Disperse and flush

2 LABELS

No Label Required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ethyl alpha-hydroxypropionate / Ethyl 2-hydroxypropanoate / Ethyl DL-Lactate / Lactic acid ethyl ester

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $CH_3CHOHCOOC_2H_5$

3.4 **IMCO/United Nations Numerical Designation:** 3.3 1192

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles / face shield / rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may cause drowsiness. Contact with liquid causes mild irritation / Vapors and liquid cause irritation. Ingestion may cause nausea

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air / EYES and SKIN: flush with water. INGESTION: induce vomiting / get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion.** Moderately toxic. Human systemic effects

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 118 F (OC) 115 F (CC)

6.2 **Flammable Limits in Air:** 1.5 - 11.4

6.3 **Fire Extinguishing Agents.** Water / dry chemical / alcohol foam / carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 752 F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Kay Fries Chemicals Inc
   360 Lexington Avenue
   New York, N.Y. 10017
2. Vertac Chemical Co
   12602 Northern Boulevard
   Flushing, N.Y. 11358
3. Eastman Kodak Co
   Eastman Organic Chemicals
   Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

VPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 118.1

13.3 **Boiling Point at 1 atm:** 307 F = 153 C = 427 K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.03 at 20°C (liquid)

13.8 **Liquid Surface Tension.** 29.20 dynes/cm = 0.0292 N/m at 20 C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible] = 6,900 cal/g = 27,800 J/g

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Data not available

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

EMC — ETHYL MERCAPTAN

Common Synonyms

Ethanethiol
Mercaptoethane
Ethyl sulfhydrate
Thioethyl alcohol

Liquid | Colorless to yellow | Strong skunk-like odor

Floats and mixes slowly with water. Poisonous, flammable vapor is produced. Boiling point is 95° F.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources; do not flare, smoke or strike any kind of match or flame.
Stop discharge if possible.
Water spray may be useful in controlling vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish small fires with dry chemical, CO2, water spray or foam.
Water may be ineffective for fighting fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.
VAPOR.
POISONOUS IF INHALED.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID.
POISONOUS IF SWALLOWED.
IF SWALLOWED and victim is CONSCIOUS, induce vomiting by tickling back of throat or by giving salt water to drink.
IF SWALLOWED and victim is UNCONSCIOUS OR CONVULSING, DO NOTHING BY MOUTH. Call physician immediately.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-6

Immediate Precautionary Measures
Small Spill
Large Spill
Fire
Disposal

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms. Ethanethiol; Ethyl Mercaptan; Thioethyl Alcohol
3.2 Coast Guard Compatibility Classification. Not applicable
3.3 Chemical Formula. C_2H_5SH
3.4 IMCO/United Nations Numerical Designation. 1228

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped) Liquid
4.2 Color Colorless
4.3 Odor Strong skunk-like odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment. Protective clothing; goggles; self-contained breathing apparatus; rubber boots; gloves.
5.2 Symptoms Following Exposure. Inhalation: Headache, nausea, dizziness, unconsciousness. Ingestion: Nausea and vomiting.
5.3 Treatment for Exposure. INHALATION: Remove victim to fresh air. Give oxygen if breathing is difficult. Give artificial respiration if victim is not breathing. EYES: Flush with plenty of water. SKIN: Wash with soap and water. INGESTION: Induce vomiting by tickling back of throat or by giving salt water to drink. Call physician immediately.
5.4 Toxicity by Inhalation (Threshold Limit Value) 10 ppm
5.5 Short-Term Inhalation Limits. Data not available
5.6 Toxicity by Ingestion. Grade 3: Moderately toxic
5.7 Late Toxicity. May cause liver damage.
5.8 Vapor (Gas) Irritant Characteristics. Data not available
5.9 Liquid or Solid Irritant Characteristics. Data not available
5.10 Odor Threshold. 0.19 ppm

6 FIRE HAZARDS

6.1 Flash Point. -50 F (-45 C)
6.2 Flammable Limits in Air. 2.8% to 18.0%
6.3 Fire Extinguishing Agents. Dry chemical, foam, carbon dioxide, water.
6.4 Fire Extinguishing Agents Not to be Used. Water may be ineffective.
6.5 Special Hazards of Combustion Products. Irritating fumes, sulfur dioxide are generated.
6.6 Behavior in Fire. Vapor may travel to source of ignition and flash back; containers may explode in fire. Poisonous fumes are released when heated.
6.7 Ignition Temperature. 570 F (299 C)
6.8 Electrical Hazard. Data not available.
6.9 Burning Rate. Data not available.

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water. No reaction
7.2 Reactivity with Common Materials. No reaction
7.3 Stability During Transport. Stable
7.4 Neutralizing Agents for Acids and Caustics. Not pertinent
7.5 Polymerization. Not pertinent
7.6 Inhibitor of Polymerization. Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity. Data not available
8.2 Waterfowl Toxicity. Data not available
8.3 Biological Oxygen Demand (BOD). Data not available
8.4 Food Chain Concentration Potential. None

9 SELECTED MANUFACTURERS

Pennwalt Corporation
Chemicals Div.
Tyler Pa. Plant
Philadelphia, Pennsylvania

Phillips Petroleum Co.
Chemical Department
Special Products Div.
Bartlesville, Oklahoma 74004

Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 Grades of Purity. 99%
10.2 Storage Temperature. Room temp.
10.3 Inert Atmosphere. No requirement
10.4 Venting. Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

APOTUVW

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.
Flammable liquid
*12.2 NAS Hazard Rating for Bulk Water Transportation. Not listed
*12.3 NFPA Hazard Classifications.

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State (15°C and 1 atm). Liquid
13.2 Molecular Weight. 62.13
13.3 Boring Point at 1 atm. 95 F (35 C, 308 K)
13.4 Freezing Point. -219 F (-137 C, 136 K)
13.5 Critical Temperature. 352 F (178 C, 451 K)
13.6 Critical Pressure. 790 psia (53.7 atm, 5.44 MN/m²)
13.7 Specific Gravity. 0.839 at 20 C (liquid)
13.8 Liquid Surface Tension. 24.9 dynes/cm = 0.0249 N/m at 20 C
13.9 Liquid-Water Interfacial Tension. 25 dynes/cm = 0.025 N/m at 20 C
13.10 Vapor (Gas) Specific Gravity. 2.1
13.11 Ratio of Specific Heats of Vapor (Gas). 1.08 at 68 F
13.12 Latent Heat of Vaporization. 165 Btu/lb, 92.3 cal/g, 3.85 x 10⁵ J/kg
13.13 Heat of Combustion. -14,800 Btu/lb, -8,220 cal/g, -3.44 x 10⁷ J/kg
13.14 Heat of Decomposition. Not pertinent
13.15 Heat of Solution. Not pertinent
13.16 Heat of Polymerization. Not pertinent

(continued on page 2)

NOTES

ETM ETHYL METHACRYLATE

Common Synonyms
Ethyl methacrylate inhibited
Methacrylic acid ethyl ester
Ethyl 2-methacrylate
Ethyl alpha-methylacrylate
Ethyl 2-methyl 2-propenoate

Liquid | Colorless | Sharp unpleasant odor

Floats on water

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate water for high flammability
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ethyl 2-methacrylate, Ethyl methacrylate inhibited, Ethyl alpha-methylacrylate, Ethyl 2-methyl 2-propenoate, Methacrylic acid ester

3.2 **Coast Guard Compatibility Classification:** Acrylate

3.3 **Chemical Formula** $CH_2=C(CH_3)COOC_2H_5$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Acrid, sharp

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Impervious gloves, chemical goggles, face shield or hood for breathing apparatus if exposed to vapors or spills

5.2 **Symptoms Following Exposure:** Inhalation may cause irritation to respiratory system and lungs. Ingestion causes irritation with abdominal pain. Contact irritates eyes and skin

5.3 **Treatment for Exposure:** INHALATION remove victim to fresh air, apply artificial respiration and oxygen if indicated. INGESTION induce vomiting, call physician. EYES wash with water for 15 minutes, call physician. SKIN flush with water and wash with soap

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 3; rat LD_{50} 4 g/kg or less

5.7 **Late Toxicity:** Causes birth defects in experimental animals

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** 55°F (C.C.) 50°F (O.C.)

6.2 **Flammable Limits in Air:** 1.8% (LEL)

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire.** Sealed containers may rupture, explosively if heated, can cause violent polymerization reaction with rapid release of energy. Vapors are heavier than air and can travel to source of ignition and flash back

6.7 **Ignition Temperature** 750°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** If proper concentration of inhibitor is not present or when material is heated, exothermic polymerization reaction can occur

7.6 **Inhibitor of Polymerization.** Oxygen in the air inhibits polymerization

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Polysciences Inc.
Paul Valley Industrial Park
Warrington, Pa. 18976

Rohm and Haas
Independence Mall West
Philadelphia, Pa. 19105

3. E. I. duPont de Nemours & Co., Inc.
Plastics Dept.
Polymer Products Division
Wilmington, Del. 19898

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical

10.2 **Storage Temperature:** Below 95°F (100°F)

10.3 **Inert Atmosphere:** Ventilated storage

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XTLZ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 114

13.3 **Boiling Point at 1 atm.** 244°F (118°C) (391 K)

13.4 **Freezing Point:** -67°F (-55°C) (218°K)

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.91-0.92 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension.** Data not available

13.10 **Vapor (Gas) Specific Gravity:** 3.9

13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.06+

13.12 **Latent Heat of Vaporization.** 170 Btu/lb, 95 cal/g, 4.0×10^5 J/kg

13.13 **Heat of Combustion** -12,670 Btu/lb, -7040 cal/g, -30.4×10^6 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** -258 Btu/lb, -143 cal/g, -5.96×10^5 J/kg

Continued on page 4 and 5

NOTES

ETN ETHYL NITRITE

Common Synonyms

Nitrous ether
Sweet spirit of nitre
Spirit of ether nitrite

Liquid | Colorless to light yellow | Pleasant odor

Floats on water. May boil on water. Boiling point in °C [°F]

Shut off flame & sources of all fire department
Stop discharge if possible. Keep people away
Isolate and remove leaking material
Notify authorities if liquid enters sewer

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus
Cool containers from safe distance or protected location
Extinguish with water [illegible]

Exposure

Get medical aid

VAPOR

If inhaled will cause headache, dizziness or loss of consciousness
Move victim to fresh air
If not breathing, give artificial respiration
If breathing is difficult, give oxygen

LIQUID

If swallowed will cause headache or loss of consciousness
IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Isolate and deny flammability
Remove sources
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nitrous ether; Spirit of ether; nitrite; Sweet spirit of nitre
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** C_2H_5ONO
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Aromatic, ethereal characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles; clothing and rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation of vapor may cause headache, increased pulse rate, decreased blood pressure, and unconsciousness. Contact with liquid or vapor may irritate eyes and skin
5.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if not breathing, give artificial respiration; call physician. EYES: flush with water; call physician. SKIN: flush with water; wash with soap and water; call medical attention. INGESTION: do not induce vomiting; call physician
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** -31 [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Water; dry chemical; foam; carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen are generated
6.6 **Behavior in Fire:** Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back; containers may explode in fire
6.7 **Ignition Temperature:** 194 [illegible]
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable if stored in a cool place and not exposed to strong light
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Mallinckrodt Chemical Works
22 West Side Avenue
P.O. Box 444
Jersey City, N.J. 07304

Platz and Baus, Inc.
12-04 Northern Boulevard
Flushing, N.Y. 11354

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Officially specified as 95% and 98% by volume with the balance being ethyl alcohol
10.2 **Storage Temperature:** Cool ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A B C D E [illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	3
Water Pollutant	
Human Toxicants	
Aquatic Toxicity	
Aesthetic Effects	
Reactivity	
Other Hazards	
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 75
13.3 **Boiling Point at 1 atm:** 63 F = 17°C = 290 K
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.90 at 4°C (liquid)
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** 2.6
13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1948

NOTES

EPS ETHYLPHENYLDICHLOROSILANE

Common Synonyms	Liquid Colorless Sharp irritating odor Reacts with water. Exposure gas is produced on contact with water
	[illegible]
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	[illegible] GAS PRODUCED IN REACTION WITH WATER POISONOUS IF INHALED Irritating to eyes, nose and throat [illegible] LIQUID Will burn skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Isolate and keep unnecessary people away from spill
Ventilate area
Disperse and flush with water

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** [illegible]
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $C_{14}H_{16}Cl_2Si$
3 4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Sharp. Like hydrochloric acid

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Acid vapor type respirators or positive pressure type chemical worker's goggles; other equipment as necessary to protect skin and eyes
5 2 **Symptoms Following Exposure:** Inhalation irritates nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach
5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; give artificial respiration if needed; call physician. EYES: flush with water for 15 minutes; obtain medical attention immediately. SKIN: flush with water; obtain medical attention if burning has occurred. INGESTION: if victim is conscious, give large amounts of water; then induce vomiting; get medical attention
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 1 [illegible] mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics:** Severe eye irritant. Causes second and third degree burns on short contact and is very injurious to the eyes
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** > 200 F OC
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Water jet
6 5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene fumes may be formed
6 6 **Behavior in Fire:** Difficult to ignite; if ignited will burn; contact with water applied to adjacent fires may cause generation of toxic hydrogen chloride gas
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts with water to generate hydrogen chloride gas which is corrosive to most metals
7 2 **Reactivity with Common Materials:** Will react with surface moisture to evolve hydrogen chloride which is corrosive to most common metals
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water; then with sodium bicarbonate or some other base
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Corning Corporation
P O Box 592
Midland, Michigan 48640

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vent

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

NO

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Materials	0
Water	3
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 295.1
13 3 **Boiling Point at 1 atm:** > 400 F = > 204°C = > 477°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.09 at 15°C (liquid)
13 8 **Liquid Surface Tension:** [illegible]
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** [illegible]
13 13 **Heat of Combustion:** [illegible]
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 2)

NOTES

EPD	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS

Common Synonyms

Ethanephosphonothioic dichloride

Liquid | Colorless | Choking odor

Reacts with water. Poisonous gas is produced on contact with water.

May decompose if possible. Keep away from ... Call fire department. Isolate and deny unauthorized access. ... Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES ARE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, carbon dioxide.
DO NOT USE WATER OR FOAM ON FIRE.

Exposure

CALL FOR MEDICAL AID.
GAS PRODUCED IN REACTION WITH WATER.
POISONOUS IF INHALED.
Irritating to eyes, nose and throat.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is conscious, induce vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-1

Immediate precautionary measure: Isolate and deny unauthorized access.
Recommended clean-up procedure: Dispose of by burial in a sanitary landfill.

2 LABEL



3 CHEMICAL DESIGNATION*

3.1* Synonyms: Ethanephosphonothioic dichloride; Ethanephosphonothioyl dichloride

3.2 Coast Guard Compatibility Classification: Not applicable

3.3 Chemical Formula: $C_2H_5PSCl_2$

3.4 IMCO/United Nations Numerical Designation: 1760

4 OBSERVABLE CHARACTERISTICS

4.1* Physical State (as shipped): Liquid

4.2 Color: Colorless

4.3 Odor: Noticeable odor

5 HEALTH HAZARDS

5.1* Personal Protective Equipment: Wear rubber or neoprene gloves, rubber boots, and goggles.

5.2 Symptoms Following Exposure: Inhalation of ... may cause pulmonary edema and severe irritation of the eyes, nose, and throat. Symptoms may be delayed. Allow victim to rest because physical exertion during period of pulmonary edema may be fatal. Contact with liquid causes painful irritation. Eyes and skin may be severely injured. Liquid is absorbed through the skin. Ingestion causes severe irritation of the mouth and stomach.

5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air. If breathing has stopped, ... should be used. If pulmonary edema is present, oxygen should be administered by a physician or other person trained in its use. Because effects may be delayed, 24 hours of observation is recommended. EYES: Flush thoroughly with water and seek medical attention. Apply ... may be dropped in eyes. SKIN: Wash affected areas with soap and water. INGESTION: Give large amounts of water; induce vomiting; get medical attention. Other treatment is symptomatic.

5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available

5.5 Short-Term Inhalation Limits: Data not available

5.6 Toxicity by Ingestion: Grade 2 LD50 (Mouse) 46 mg/kg

5.7 Late Toxicity: Data not available

5.8 Vapor (Gas) Irritant Characteristics: Data not available

5.9 Liquid or Solid Irritant Characteristics: Data not available

5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 Flash Point: [illegible] F (OC)

6.2 Flammable Limits in Air: Data not available

6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide

6.4 Fire Extinguishing Agents Not to be Used: Water or foam

6.5 Special Hazards of Combustion Products: Oxides of sulfur, phosphorus, hydrogen chloride and phosgene

6.6 Behavior in Fire: Container may explode in heat of fire

6.7* Ignition Temperature: Data not available

6.8 Electrical Hazard: Data not available

6.9 Burning Rate: Data not available

7 CHEMICAL REACTIVITY

7.1* Reactivity with Water: Reacts with water to give toxic hydrogen chloride (hydrochloric acid) and ...

7.2* Reactivity with Common Materials: Will react with surface moisture to evolve hydrogen chloride which can cause corrosion of metals.

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: Flood with water, treat with sodium bicarbonate or lime solution.

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): Data not available

8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

[illegible] Corporation
Industrial Chemicals Division
[illegible] Tower
[illegible] Florida
Baton Rouge, Louisiana [illegible]

[illegible] Plaza and Basic Inc.
[illegible] Southern Boulevard
Hawthorne, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1* Grades of Purity: Commercial

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: Blanketed with dry nitrogen

10.4 Venting: Pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

XO

12. HAZARD CLASSIFICATIONS

*12.1 Code of Federal Regulations: Corrosive material

*12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed

*12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm: Liquid

*13.2 Molecular Weight: [illegible]

*13.3 Boiling Point at 1 atm: [illegible] F ([illegible] C, [illegible] K)

*13.4 Freezing Point: [illegible] F ([illegible] C, [illegible] K)

13.5 Critical Temperature: Not pertinent

13.6 Critical Pressure: Not pertinent

13.7* Specific Gravity: [illegible] at 20°C (liquid)

13.8 Liquid Surface Tension: [illegible] dynes/cm at [illegible]°C

13.9 Liquid-Water Interfacial Tension: Not pertinent

13.10 Vapor (Gas) Specific Gravity: Not pertinent

13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent

13.12 Latent Heat of Vaporization: Not pertinent

13.13 Heat of Combustion: [illegible] Btu/lb (4,280 cal/g) = [illegible] kJ/kg

13.14 Heat of Decomposition: Not pertinent

13.15 Heat of Solution: Data not available

13.16 Heat of Polymerization: Not pertinent

Continued on page [illegible]

NOTES

EPP ETHYL PHOSPHORODICHLORIDATE

Common Synonyms

Phosphorodichloridic acid ethyl ester
Ethyl dichlorophosphate

Liquid | Colorless | Choking odor

Reacts with water. Irritating gas is produced on contact with water.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles, self contained breathing apparatus and rubber protective clothing (including gloves).
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Fire data not available

Exposure

Call for medical aid.

VAPOR

Irritating to eyes, nose and throat.
Harmful if inhaled.
Move victim to fresh air.
If breathing is difficult, give oxygen.

LIQUID

Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: corrosive water contaminant.
Restrict access.
Disperse and flush with care.

2 LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethyl dichlorophosphate; Phosphorodichloridic acid ethyl ester
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $C_2H_5OPCl_2$
3.4 **IMCO/United Nations Numerical Designation:** 9/1760

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Acrid, choking

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles and face shield; self contained or air line respirator; rubber gloves, boots, and clothing.
5.2 **Symptoms Following Exposure.** Inhalation of vapor irritates nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.
5.3 **Treatment for Exposure.** INHALATION: remove victim from exposure; if his breathing has stopped, start artificial respiration; call a doctor. EYES: flush with water for at least 15 min; get medical attention for burns. SKIN: flush with water; get medical attention for burns. INGESTION: do NOT induce vomiting; give large amounts of water, followed by milk or milk of magnesia.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion.** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Data not available
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam
6.5 **Special Hazards of Combustion Products.** Irritating fumes of hydrogen chloride and phosphoric acid may be formed.
6.6 **Behavior in Fire.** Contact with water applied to adjacent fires produces irritating fumes of hydrogen chloride.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with water to evolve hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials:** Will react with surface moisture to evolve hydrogen chloride which is corrosive to common metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water; rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, Wis. 53233

2 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 97%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 162.9
13.3 **Boiling Point at 1 atm.**
333°F = 167°C = 440°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.35 at 15°C (liquid)
13.8 **Liquid Surface Tension** (est.)
32.5 dynes/cm = 0.0325 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent
13.12 **Latent Heat of Vaporization:**
Not pertinent
13.13 **Heat of Combustion.** (est.) = -4 700 Btu/lb
= -2 600 cal/g = -110 × 10^3 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization.** Not pertinent

(Continued on page 5 and 6)

NOTES

EPA 2-ETHYL-3-PROPYLACROLEIN

Common Synonyms
2 Ethyl-2-hexenal
2 Ethyl-3-propyl acrylaldehyde

Liquid Yellow

Floats on water

Fire

Combustible

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** 2 Ethyl 2 hexenal
2 Ethyl 3 propylacrylaldehyde

3 2 **Coast Guard Compatibility Classification**
Aldehyde

3 3 **Chemical Formula**
$CH_3CH_2CH{=}CCHOCH_2CH_2CH_3$

3 4 **IMCO/United Nations Numerical Designation:** 33 1191

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Yellow

4 3 **Odor** Sharp powerful irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Protective clothing eye protection approved respirator for high vapor concentrations

5 2 **Symptoms Following Exposure** Vapor is irritating Contact produces skin and eye irritation

5 3 **Treatment for Exposure** Remove from exposure Wash affected areas of body with water for 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 0.5 to 5 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics** Causes smarting of the skin and first degree burns on short exposure may cause secondary burns on long exposure

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 155°F O C

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents:** Alcohol foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6 5 **Special Hazards of Combustion Products**
Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** 200 C

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
52 s (theor) 10 days

8 4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 **Grades or Purity:** Technical

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 2)

VTU

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** 126 2

13 3 **Boiling Point at 1 atm:**
283°F = 175°C = 448°K

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity.** 0 85 at 15 C (liquid)

13 8 **Liquid Surface Tension.**
29 2 dynes/cm = 0 0292 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension**
test 140 dynes/cm = 0 04 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity.**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization.**
Not pertinent

13 13 **Heat of Combustion** -15,610 Btu/lb
= -8670 cal/g = 363 × 10³ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

ESC ETHYL SILICATE

Common Synonym

Tetraethyl silicate
Silbond
Tetraethyl orthosilicate
Ethyl orthosilicate
Ethyl silicate 40
Ethyl silicate condensed

Waters liquid — Colorless — Mild odor

May float or sink in water. Reacts slowly with water.

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with water fog. Do not get solid stream directly on material.

Exposure

Call for medical aid.
LIQUID.
Irritating to eyes.
If swallowed will cause nausea and vomiting.
Remove contaminated clothing at once.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS have victim drink water (one pint at most) and induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVE CONVULSIONS do not induce vomiting or give anything by mouth.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify owners of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush.

2. LABELS

No label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Ethyl orthosilicate; Ethyl silicate 40; Ethyl silicate condensed; Silbond; Tetraethyl orthosilicate; Tetraethyl silicate

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula.** $C_8H_{20}O_4Si$

3.4 **IMCO/United Nations Numerical Designation** 3.3 / 292

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild and nonresidual fruit

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Rubber or polyethylene gloves; safety glasses or other form of eye protection; self contained breathing apparatus or one that absorbs organic vapors.

5.2 **Symptoms Following Exposure.** Inhalation of vapor can cause eye and nose irritation, unsteadiness, tremors, salivation, respiratory difficulty and unconsciousness. Contact with liquid irritates eyes and may cause dryness, cracking and inflammation of skin. Ingestion may produce nausea, vomiting and cramps.

5.3 **Treatment for Exposure:** INHALATION remove patient from contaminated atmosphere; if his breathing has ceased start mouth to mouth artificial respiration; oxygen if available should be administered only by an experienced person when authorized by a physician; keep patient warm and comfortable; call physician immediately. EYES flush immediately with large quantities of running water for at least 15 min; obtain medical attention if irritation persists. SKIN immediately flush affected areas with large volumes of water; obtain medical attention if irritation persists. INGESTION give large amounts of water or warm salty water and induce vomiting; milk, eggs or olive oil may then be given; obtain medical attention if abdominal discomfort persists.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5.5 **Short-Term Inhalation Limits.** 700 ppm for 30 min

5.6 **Toxicity by Ingestion** Data not available

5.7 **Late Toxicity:** Liver, kidney and lung damage may result from severe exposures by inhalation or ingestion.

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

(Continued on page 4)

6 FIRE HAZARDS

6.1 **Flash Point.** 125°F (OC) 99°F (CC)

6.2 **Flammable Limits in Air:** LEL = 2%

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Data not available

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate.** 4.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly forming non-toxic silica and ethyl alcohol

7.2 **Reactivity with Common Materials.** Causes swelling and hardening of some plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Stauffer Chemical Company
Specialty Chemical Division
Westport, Conn. 06880

2. Union Carbide Corporation
Chemicals and Plastics Div.
270 Park Avenue
New York, N.Y. 10017

3. Dynamit Nobel of America, Inc.
105 Stonehurst Court
Northvale, N.J. 07647

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 90, 99+%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting:** Open (flame proof)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NOTUNY

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NA Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 208.3

13.3 **Boiling Point at 1 atm:** 336°F = 169°C = 442°K

13.4 **Freezing Point:** −121.2°F = −85.2°C = 187.9°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.933 at 20°C (liquid)

13.8 **Liquid Surface Tension.** 22.8 dynes/cm = 0.0228 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 99 Btu/lb = 55 cal/g = 2.2 × 10⁵ J/kg

13.13 **Heat of Combustion.** (est.) −12 000 Btu/lb = −6 700 cal/g = −280 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

5 HEALTH HAZARDS (Cont'd.)

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 85 ppm

ETS ETHYLTRICHLOROSILANE

Common Synonyms

Trichloroethylsilane
Ethylsilicon trichloride
Ethylsilicone trichloride
Trichloroethylsilane

Liquid | Colorless | Sharp irritating odor

Reacts violently with water. Irritating gases produced on contact with water.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles, self-contained breathing apparatus and rubber protective clothing (minimum).
Shut off ignition sources. Call fire department.
Stop leak if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, alcohol foam, carbon dioxide.
Water may be ineffective in fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause difficult breathing.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and pollution officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, corrosive.
Restrict access.
Personnel as upwind as feasible.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethylsilicon trichloride; Ethylsilicon trichloride; Trichloroethylsilane; Trichloroethylsilicone
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula.** $C_2H_5SiCl_3$
3.4 **IMCO/United Nations Numerical Designation.** 3.2/1196

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sharp hydrochloric acid like pungent acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Full protective clothing, and vapor type respirators plus rubber gloves, chemical worker's goggles, other equipment as necessary to protect skin and eyes.
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes burns of mouth and stomach.
5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, administer artificial respiration if breathing has stopped, call physician. EYES: flush with water for 15 min., obtain medical attention immediately. SKIN: flush with water, obtain medical attention immediately if irritation persists. INGESTION: give large amounts of water, get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1,370 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes severe irritation of the eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point.** 90°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases will form
6.6 **Behavior in Fire.** Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back. Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires will produce irritating, hydrogen chloride fumes.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 2.0 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously evolving hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials:** Reacts with surface moisture to form hydrogen chloride which is corrosive to common metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Div.
270 Park Avenue
New York, N.Y. 10017

2. Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640

3. Petrarch Systems
P.O. Box 141
Levittown, Pa. 19059

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

XO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	3
Self Reaction	1

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight.** 163.5
13.3 **Boiling Point at 1 atm**
210°F = 99°C = 372°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.24 at 25°C (liquid)
13.8 **Liquid Surface Tension** (est.)
25 dynes/cm = 0.025 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity** 5.6
13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent
13.12 **Latent Heat of Vaporization:** 104 Btu/lb
= 58 cal/g = 2.4 × 10⁵ J/kg
13.13 **Heat of Combustion.** (est.) −4,400 Btu/lb
= −2,400 cal/g = −100 × 10⁵ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

FAC FERRIC AMMONIUM CITRATE

Common Synonyms
Ammonium ferric citrate
Ferric ammonium citrate brown
Ferric ammonium citrate, green

Solid Red, green or brown Odorless

Sinks and mixes slowly with water

Avoid contact with solid and dust. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If contact with eyes, rinse immediately with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, administer drink of water or milk.
IF SWALLOWED and victim is NOT CONSCIOUS OR RAVING, CONVULSING or vomiting, except to keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Ammonium ferric citrate
Ferric ammonium citrate, brown
Ferric ammonium citrate, green

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula.** Mixture of $FeC_6H_5O_7$ $(NH_4)_3C_6H_5O_7$ and water of hydration

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color:** Red, green or brown
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved respirator for nuisance dust. Chemical goggles or face shield.

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and causes mild irritation of skin on prolonged contact.

5 3 **Treatment for Exposure:** INGESTION: give large amount of water. EYES or SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 mg/m³ (as iron)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen or ammonia gas may be formed in fires.

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Pfizer Chemicals Div
235 E 42nd St
New York, N Y 10017

2 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 384
Jersey City, N J 07303

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15° C and 1 atm:** Solid

13 2 **Molecular Weight:** Not pertinent (mixture)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.8 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

FAO

FERRIC AMMONIUM OXALATE

Common Synonyms			
Ammonium ferric oxalate trihydrate Ammonium trioxalatoferrate (III) trihydrate	Solid powder	Yellowish-green	Light burnt sugar odor
	Sinks and mixes with water		

[illegible] contact with solid and dust. Keep [illegible]
[illegible] discharge if possible.
[illegible]
[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]
SOLID
Will burn skin and eyes
If swallowed will cause nausea and vomiting
[illegible]
Flood affected areas with plenty of water
IF EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning if water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium ferric oxalate trihydrate; Ammonium trioxalatoferrate trihydrate

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula:** $FeNH_4C_2O_4 \cdot 3H_2O$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color.** Yellowish green

4 3 **Odor.** Slight burnt sugar odor

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved dust respirator, rubber or plastic coated gloves, chemical goggles or face shield

5 2 **Symptoms Following Exposure** Inhalation of dust may cause irritation of nose and throat. Ingestion causes burning pain in throat and stomach; mucous membranes become white; may also cause vomiting, weak pulse, cardiac collapse and death. Contact with dust irritates eyes and skin; may cause severe skin burns.

5 3 **Treatment for Exposure** *treat victim promptly.* INHALATION move to fresh air; get medical attention if any symptoms persist. INGESTION give ammonia diluted with milk; induce vomiting; get medical attention. If shock or edema of the glottis and delayed constriction of esophagus. EYES flush with water and get medical attention. SKIN flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m (as iron)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen, ammonia and carbon monoxide may be produced

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Not reactive

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Pfizer Chemicals Div
235 E 42nd St
New York, N Y 10017

2 Pfalz and Bauer Inc
[illegible] Fairfield Ave
N [illegible] Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

NS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 428

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.78 at 20 C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on page 5 of A)

NOTES

FCL FERRIC CHLORIDE

Common Synonyms
Iron III chloride
Iron perchloride
Iron trichloride
Ferric chloride anhydrous
Ferric chloride, hexahydrate

Solid | Greenish black | Odorless

Sinks and mixes with water

[illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

[illegible]

SOLID
Will burn skin and eyes
If swallowed will cause nausea and vomiting

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

Hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ferric chloride anhydrous, Ferric chloride hexahydrate, Iron (III) chloride, Iron perchloride, Iron trichloride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $FeCl_3$ or $FeCl_3 \cdot 6H_2O$

3 4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Anhydrous greenish black, Hydrate brown

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator if required, rubber apron and boots, chemical worker's goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes. Prolonged contact with skin causes irritation and burns.

5 3 **Treatment for Exposure:** INGESTION: give large amounts of water, induce vomiting if large amounts have been swallowed. EYES: immediately flush with gents of water for at least 15 min, get medical attention promptly. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5 5 **Short-Term Inhalation Limits:** [illegible]

5 6 **Toxicity by Ingestion:** [illegible]

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** [illegible]

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used**

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Water solutions are acidic and corrosive to most metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute sodium bicarbonate or soda ash solutions

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 1.2 ppm 144 hr stickleback harmful fresh water
1 ppm 240 hr stickleback safe fresh water
18 ppm 96 hr daphnia TL_m fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pennwalt Corp
Three Parkway
Philadelphia, Pa 19102

2 Dow Chemical Co
Midland, Mich 48640

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Anhydrous
Hydrate Reagent 40% solution in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 162.22 (anhydrous)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.9 at 20°C (anhydrous solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (anhydrous) = [illegible]

13 16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

FCP

FERRIC GLYCEROPHOSPHATE

Common Synonyms

Solid — Greenish brown to greenish yellow

Sinks and mixes with water

Avoid contact with solid and dust. Keep people away.
Stop discharge if possible.
Isolate and remove uncontaminated material.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.

If in eyes, hold eyelids open and flush with plenty of water.
If clothing is contaminated, remove it if safe to do so.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected area with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have him drink water, milk or milk of magnesia.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Coast Guard or Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** (approx.) $FeC_3H_8O_9PO_4 \cdot H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Greenish brown to greenish yellow
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, dust mask, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Contact with dust irritates eyes and on prolonged contact skin
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water, induce vomiting if large amounts have been swallowed. EYES: flush with water for at least 15 min. SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ (as Fe)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire.**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Platz and Bauer Inc.
476 Fairfield Ave.
Stamford, Conn. 06902
2. Shepherd Chemical Co.
4900 Beech St.
Cincinnati, Ohio 45212

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

XX

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 470 (approx.)
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.5 at 20 C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5A

NOTES

FNT FERRIC NITRATE

Common Synonyms			
Ferric nitrate nonahydrate Nitric acid, iron(III) salt	Solid	Green, colorless to pale violet	Odorless
	Sinks and mixes with water		

Avoid contact with solid or concentrated solutions
Stop discharge if possible
Isolate and restrict discharge if material
Notify local health and pollution control agencies

Fire

Not flammable
Will increase the intensity of a fire.
Extinguish fires using agent suitable for surrounding fire

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
In case of contact, immediately flush eyes with plenty of water
For prolonged exposure to dust, use an approved respirator
Remove victim to fresh air if effects occur

SOLID
Irritating to skin and eyes
Harmful if swallowed
Avoid any skin contact or inhalation of dust
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, give large amounts of water, induce vomiting
and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS
Do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Dispersal and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ferric nitrate nonahydrate; Nitric acid, iron(+3) salt
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Fe(NO_3)_3 \cdot 9H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Green, colorless to pale violet
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eye, and can irritate skin on prolonged contact
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water, induce vomiting if large amounts have been swallowed. EYES: flush with water, get medical attention if irritation persists. SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m (as iron)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2, LD_{50}: 0.5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Non-flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:**
6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and nitric acid vapor may form in fires
6 6 **Behavior in Fire:** In contact with combustible materials will increase the intensity of a fire. Apply water to cool containers or spilled material
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Solutions are corrosive to most metals. Contact of solid with wood or paper may cause fire
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Div
P O Box 70
Morristown, N J 07960

2 J T Baker Chemical Co
Phillipsburg, N J 08865

3 Gallard-Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical 90%, Analytical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 404.02
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** 47°C = 320 K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.7 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** 42.8 kcal/mole = 22 cal/g = 0.92×10^5 J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

FSF	# FERRIC SULFATE

Common Synonyms
iron(III) sulfate
iron tersulfate
iron sesquisulfate

Solid | Gray to white | Odorless

Sinks and mixes slowly with water

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Disperse and flush

2 LABELS

Not hazardous regulated by U.S. Coast Guard Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Iron sesquisulfate; Iron(III) sulfate; Iron tersulfate

3.2 **Coast Guard Compatibility Classification.** Not Listed

3.3 **Chemical Formula:** $Fe_2(SO_4)_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Gray to white

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask; goggles; chemical protective clothing

5.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and skin. Vapor is expected to be

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large quantities of water; induce vomiting. Large amounts should be given. EYES: flush with water for 15 minutes. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion.** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Corrosive to copper, copper alloys, mild steel and galvanized steel

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.1% tilapia: 72-24 hr; fish survive; carp suckers killed; fresh water
>33 ppm: 48 hr; mosquito fish; TL_m; fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. [illegible] Baker Chemical Co
Phillipsburg, N.J. 08865

2. Cities Service Co
Industrial Chemicals Div
3445 Peachtree Road, N.E.
Atlanta, Ga. 30326

3. Mallinckrodt Chemical Works
675 Westside Ave
P.O. Box 368
Jersey City, N.J. 07304

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Anhydrous; Hydrate; 72% sometimes shipped as water solutions which are acidic

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NA

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 399.88

13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.1 at 20°C (solids)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

FAS — FERROUS AMMONIUM SULFATE

Common Synonyms
Mohr's salt
Iron ammonium sulfate
Ferrous ammonium sulfate hexahydrate

Solid | Pale blue-green | Odorless

Sinks and mixes slowly with water

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Dilute and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium ferrous sulfate; Ammonium iron sulfate; Ferrous ammonium sulfate hexahydrate; Iron ammonium sulfate; Mohr's salt

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $FeSO_4(NH_4)_2SO_4 \cdot 6H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Pale bluish green

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat; ingestion causes irritation of mouth and stomach. Dust irritates eyes and can irritate skin on prolonged contact

5 3 **Treatment for Exposure:** INGESTION: give large quantities of water; induce vomiting if large amounts have been swallowed. EYES or SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ (as iron)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 3 g/kg (rat)

5 7 **Late Toxicity:** May cause eye degeneration in rabbits

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating and toxic ammonia and oxides of nitrogen may form in fires

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
General Chemical Div
4 Century
New York, N Y 10006

2 J T Baker Chemical Co
Phillipsburg, N J 08865

3 Mallinckrodt Chemical Works
2 x Westside Ave
P O Box 144
Jersey City, N J 07304

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical 99 102%; Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 392.16

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.86 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on page FAS-4

NOTES

FEC	# FERROUS CHLORIDE

Common Synonyms
Iron dichloride
Iron protochloride
Ferrous chloride tetrahydrate

Solid | Pale green | Odorless

Sinks and mixes slowly with water

Not flammable

Fire

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ferrous chloride, ferrous dichloride tetrahydrate, iron dichloride, iron protochloride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $FeCl_2 \cdot 4H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Pale green

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat, ingestion causes irritation of mouth and stomach. Dust irritates eyes and may cause skin irritation on prolonged contact

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: if large amounts are swallowed, induce vomiting and get medical help. EYES: flush with plenty of water at least 15 minutes, get medical help promptly. If effects occur, SKIN: wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible]

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Solutions may corrode metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** <18 ppm/48 hr daphnia toxic, fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640

2 Mallinckrodt Chemical Works
222 Westside Ave
P O Box 164
Jersey City, N J 07303

3 K & K Chemicals Inc
2750 Des Plaines Ave
Des Plaines, Ill 60018

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
35% solution in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** Not pertinent, decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible] (Solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** -18 Btu/lb
= -10 cal/g = -0.42 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

FFB FERROUS FLUOROBORATE

Common Synonyms
Ferrous fluoborate

Liquid — Yellow green

Sinks and mixes with water

[illegible]

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

[illegible]

VAPOR
POISONOUS IF INHALED

[illegible]

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

[illegible]

2. LABELS

[illegible] Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1* Synonyms: Ferrous fluoborate
3.2 Coast Guard Compatibility Classification: Not listed
3.3 Chemical Formula: $FeB_2F_8H_8O$
3.4 IMCO/United Nations Numerical Designation: Not listed

4 OBSERVABLE CHARACTERISTICS

4.1* Physical State (as shipped): Liquid
4.2 Color: Yellow green
4.3 Odor: Data not available

5 HEALTH HAZARDS

5.1* Personal Protective Equipment: Goggles or face shield; rubber gloves
5.2 Symptoms Following Exposure: Ingestion causes [illegible] with eyes will cause irritation
5.3 Treatment for Exposure: INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Data not available
5.7* Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Data not available
5.9 Liquid or Solid Irritant Characteristics: Data not available
5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1* Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: None
6.6 Behavior in Fire: Not pertinent
6.7* Ignition Temperature: Not pertinent
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent

7 CHEMICAL REACTIVITY

7.1* Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: [illegible]
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

*10.1 Grades of Purity: [illegible]
*10.2 Storage Temperature: Ambient
*10.3 Inert Atmosphere: [illegible]
*10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

[illegible]

12. HAZARD CLASSIFICATIONS

*12.1 Code of Federal Regulations: Not listed
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
*12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
*13.2 Molecular Weight: [illegible]
*13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
*13.4 Freezing Point: Not pertinent
*13.5 Critical Temperature: Not pertinent
*13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: [illegible]
*13.8 Liquid Surface Tension: Not pertinent
*13.9 Liquid-Water Interfacial Tension: Not pertinent
*13.10 Vapor (Gas) Specific Gravity: Not pertinent
*13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
*13.12 Latent Heat of Vaporization: Not pertinent
*13.13 Heat of Combustion: Not pertinent
*13.14 Heat of Decomposition: Not pertinent
*13.15 Heat of Solution: Not pertinent
*13.16 Heat of Polymerization: Not pertinent

[illegible]

FOX

FERROUS OXALATE

Common Synonyms			
Oxalic acid ferrous salt Ferrous Iron protoxalate Ferrous oxalate dihydrate	Solid	Yellow	Odorless
	Sinks in water		

Fire	Not Flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting, loss of consciousness
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:**

3 4 **IMCO/United Nations Numerical Designation:**

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):**

4 2 **Color:**

4 3 **Odor:**

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:**

5 2 **Symptoms Following Exposure:**

5 3 **Treatment for Exposure:**

5 4 **Toxicity by Inhalation (Threshold Limit Value):**

5 5 **Short-Term Inhalation Limits:**

5 6 **Toxicity by Ingestion:**

5 7 **Late Toxicity:**

5 8 **Vapor (Gas) Irritant Characteristics:**

5 9 **Liquid or Solid Irritant Characteristics:**

5 10 **Odor Threshold:**

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:**

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:**

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:**

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

*10 1 **Grades of Purity:**

*10 2 **Storage Temperature:** Ambient

*10 3 **Inert Atmosphere:** No requirement

*10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

11

12. HAZARD CLASSIFICATIONS

*12 1 **Code of Federal Regulations:** Not listed

*12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

*12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13 1 **Physical State at 15°C and 1 atm:** Solid

*13 2 **Molecular Weight:**

*13 3 **Boiling Point at 1 atm:** Not pertinent decomposes

*13 4 **Freezing Point:** Not pertinent

*13 5 **Critical Temperature:** Not pertinent

*13 6 **Critical Pressure:** Not pertinent

*13 7 **Specific Gravity:**

13 8 **Liquid Surface Tension:** Not pertinent

*13 9 **Liquid-Water Interfacial Tension:** Not pertinent

*13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

*13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

*13 12 **Latent Heat of Vaporization:** Not pertinent

*13 13 **Heat of Combustion:** Not pertinent

*13 14 **Heat of Decomposition:** Not pertinent

*13 15 **Heat of Solution:** Not pertinent

*13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

FRS

FERROUS SULFATE

Common Synonyms
Iron vitriol
Green vitriol
Copperas
Iron (ous) sulfate

Solid | Green | Odorless

Sinks and mixes with water

[illegible] chemical material
[illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

SOLID
If swallowed will cause nausea, vomiting or loss of consciousness
[illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR IN CONVULSIONS
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Dispersal and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Copperas
Green vitriol
Iron(ous) sulfate
Iron vitriol

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula** $FeSO_4 \cdot 7H_2O$

3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** Green

4 3 **Odor** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Mask if dust is present

5 2 **Symptoms Following Exposure** INGESTION abdominal pain retching diarrhea dehydration shock pallor cyanosis rapid weak pulse shallow respiration low blood pressure

5 3 **Treatment for Exposure** INGESTION give milk immediately and then induce vomiting by stroking the pharynx with a blunt object such as a spoon handle. Gastric lavage with 1 pint of [illegible] solution [illegible] mono- or disodium phosphate if promptly available, otherwise [illegible] Activated charcoal [illegible]

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion** Grade 2 LD$_{50}$ 0.5 to 5 g/kg (rat)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics** None

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Not flammable

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
100 ppm 4-2 hr TLm (lethal) fresh water
96 ppm 48 hr shrimp LC$_{50}$ salt water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Cosmin Corp
830 North East Loop
San Antonio Tex 78209

2 NL Industries Inc
Titanium Pigment Division
St Louis Mo 63111

3 Pfizer Inc
C K Williams & Co Division
640 N 13th St
Easton Pa 18042

10 SHIPPING INFORMATION

10 1 **Grades or Purity** USP Commercial

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight** 169.96

13 3 **Boiling Point at 1 atm** Not pertinent

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 1.90 to 1.96 (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

FXX FLUORINE

Common Synonyms

Liquefied gas Clear to yellow Very irritating odor

Liquid sinks and boils in water Poisonous visible vapor cloud is produced

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
Wear chemical protective suit
Stop discharge if possible
Evacuate area in case of large discharge
Notify local health and pollution control agencies

Fire

Not flammable
WILL CAUSE FIRE AND REACT VIOLENTLY WITH COMBUSTIBLES
POISONOUS GAS IS PRODUCED IN FIRE
Wear chemical protective suit with self-contained breathing apparatus
Combat fires from behind barricade with unmanned hose holder or monitor nozzle
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes
Move to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID
Will burn skin and eyes
Will cause frostbite
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
DO NOT RUB AFFECTED AREAS

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-7)

Issue warning: poison
Restrict access
Evacuate area

2. LABELS



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula** F_2
3 4 **IMCO, United Nations Numerical Designation** 2.0/1045

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Compressed gas
4 2 **Color.** Pale yellow
4 3 **Odor** Strong irritating odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Tight fitting chemical goggles, special clothing not easily penetrated by fluorine gas
5 2 **Symptoms Following Exposure** Severe burning of eyes, skin and respiratory system. The burns may develop slowly after exposure
5 3 **Treatment for Exposure.** Flush all affected parts with water for at least 15 min. Do NOT use ointments. Administer artificial respiration and oxygen if required
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 ppm
5 5 **Short-Term Inhalation Limits** 0.3 ppm for 5 min
5 6 **Toxicity by Ingestion:** Not pertinent
5 7 **Late Toxicity:** Severe burns may develop slowly after exposure
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations
5 9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes
5 10 **Odor Threshold** 0.035 ppm

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air.** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Do not direct water onto fluorine leaks
6 5 **Special Hazards of Combustion Products** Toxic gases generated in fires involving fluorine
6 6 **Behavior in Fire** Dangerously reactive. Ignites most combustibles
6 7 **Ignition Temperature** Not flammable
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Reacts with water to form hydrogen fluoride, oxygen and oxygen difluoride
7 2 **Reactivity with Common Materials:** Reacts violently with all combustible materials except the metal containers in which it is shipped
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 2.3 ppm * trout TL_m in water
*Time period not specified
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals Inc.
Allentown Pa 18105
2. Allied Chemical Corp.
Specialty Chemicals Division
Baton Rouge La 70821
3. Union Carbide Corp.
Nuclear Division
270 Park Ave.
New York N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity** 98%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XC

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Non-Flammable Gas
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	4
	W (OX)

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Gas
13 2 **Molecular Weight:** 37.99
13 3 **Boiling Point at 1 atm** -306 °F = -188 °C = 85 K
13 4 **Freezing Point.** -362 °F = -219 °C = 54 K
13 5 **Critical Temperature** -199 °F = -128 °C = 144.6 K
13 6 **Critical Pressure** 806.7 psia = 55.0 atm = 5.57 MN/m²
13 7 **Specific Gravity** 1.5 at -188 °C (gas)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.363
13 12 **Latent Heat of Vaporization** 71.6 BTU/lb = 39.8 cal/g = 1.67 × 10⁵ J/kg
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(1 atm and 20 °C unless otherwise noted)

NOTES

REVISED 1978

FSL

FLUOSILICIC ACID

Common Synonyms
Hydrofluosilicic acid
Hydrogen hexafluorosilicate
Hexafluosilicic acid
Silicofluoric acid
Fluorosilicic acid
Sand acid

Liquid | Colorless | Sharp unpleasant odor

Sinks and mixes with water

Avoid contact with liquid and vapor. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local authorities if spill enters water.

Fire

Not Flammable
Irritating gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If in eyes, flush with plenty of water for at least 15 minutes, then get medical attention.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
If swallowed will cause nausea

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting or give anything by mouth.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify local authorities if spill enters water.
Notify operators of downstream water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Hydrogen acid, Hexafluosilicic acid, Hydrofluosilicic acid, Hydrogen hexafluorosilicate, Sand acid, Silicofluoric acid

3.2 **Coast Guard Compatibility Classification** Not listed

3.3 **Chemical Formula** H_2SiF_6

3.4 **IMCO/United Nations Numerical Designation.** 1778

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Transparent straw colored to colorless

4.3 **Odor** Acrid, sharp

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Rubber gloves, safety glasses, protective clothing

5.2 **Symptoms Following Exposure** Inhalation of vapor produces severe corrosive effect on mucous membrane. Ingestion causes severe burns of mouth and stomach. Contact of liquid or vapor causes severe burns of eyes and skin.

5.3 **Treatment for Exposure** INHALATION: remove victim to fresh air and call physician. INGESTION: give large amounts of water; do NOT induce vomiting. EYES: immediately wash with water for 15 min. call physician. SKIN: wash affected parts with water; treat for hydrogen fluoride burn; wash with benzalkonium chloride soap.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Data not available

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products** Irritating fumes of hydrogen fluoride may form in fire

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** Will corrode most metals producing flammable hydrogen gas which may collect in enclosed spaces

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water; rinse with dilute solution of sodium carbonate or soda ash

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. W. R. Grace & Co.
Agricultural Chemicals Group
Baltimore, Md. 21203

2. The Hatchaw Chemical Co.
1948 E. 97 St.
Cleveland, Ohio 44106

3. Blaizard Bauer, Inc.
3 Butterfield Ave.
Stratford, Conn. 06602

10 SHIPPING INFORMATION

10.1 **Grades or Purity** 22 - 40 % solutions in water

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Corrosive liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight.** 144.09 (solute only)

13.3 **Boiling Point at 1 atm** (water) ~212°F = ~100°C = ~373°K

13.4 **Freezing Point** (typical) -2 to -3°F = -19 to -20°C = 245 to 253°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** (approx.) 1.3 at 28°C (liquid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(Continued on page 5 and 6)

NOTES

FSA FLUOSULFONIC ACID

Common Synonyms
Fluorosulfuric acid
Fluorosulfonic acid

Liquid | Colorless to light yellow | Choking odor

Reacts violently with water. Irritating mist and gas are produced on contact with water.

Fire

Not flammable

Exposure

VAPOR OR MIST
Irritating to eyes, nose and throat
Harmful if inhaled

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning, corrosive air contaminant, water contaminant
Restrict access
Evacuate area
Disperse and flush with care

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Fluorosulfuric acid, Fluorosulfonic acid
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula** FSO_3H
3.4 **IMCO/United Nations Numerical Designation** 1777

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Somewhat cloudy, colorless to straw yellow
4.3 **Odor** Choking, irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Rubber gloves, shoes and clothing; goggles and face shield; acid type canister mask or air line mask
5.2 **Symptoms Following Exposure** Inhalation of fumes causes severe irritation of nose and throat. Contact of liquid with eyes or skin causes very severe burns. Ingestion causes very severe burns of mouth and stomach.
5.3 **Treatment for Exposure** Get medical attention quickly following all exposure. In case of vapor or mist INHALATION, remove victim to fresh air. If victim is unconscious, give artificial respiration. EYES: flush with water until medical help arrives; SKIN: flush with water until medical help arrives; wash burned area using Epsom salt solution; pay particular attention to skin around fingernails. INGESTION: give large amounts of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits** Data not available
5.6 **Toxicity by Ingestion** Data not available
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even in low concentrations.
5.9 **Liquid or Solid Irritant Characteristics** Severe skin burns and eye damage; second- and third-degree burns on short contact and severe injury to the eyes.
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Do not use water or foam on adjacent fires
6.5 **Special Hazards of Combustion Products** Toxic and irritating fumes of hydrogen fluoride and sulfuric acid may form in fires
6.6 **Behavior in Fire** Contact with water or fire in adjacent fires produces toxic and irritating fumes of hydrogen fluoride
6.7 **Ignition Temperature** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Reacts violently with water to generate hydrogen fluoride and sulfuric acid
7.2 **Reactivity with Common Materials** Reacts with metals generating flammable hydrogen
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Flood with water, rinse with sodium bicarbonate or lime solution
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corporation
Specialty Chemicals Division
P O Box 4087R
Morristown, N J 07960

2 PCR Inc
P O Box 1466
Gainesville, Fla 32602

10 SHIPPING INFORMATION

10.1 **Grades of Purity** 98.5%
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Pressure vacuum with protection from moisture in air

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

XO

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Toxicity	4
Liquid or Solid Toxicity	4
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
*13.2 **Molecular Weight** 100.07
13.3 **Boiling Point at 1 atm.**
424.9°F = 162.7°C = 435.9°K
13.4 **Freezing Point**
−125.1°F = −87.3°C = 185.9°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity.** 1.734 at 25°C/4°C
13.8 **Liquid Surface Tension** Data not available
*13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity.** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** 170 Btu/lb = 95 cal/g = 3.9 × 10⁵ J/kg
*13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Data not available
13.16 **Heat of Polymerization** Not pertinent

Continued on page 5-65A

NOTES

FMS FORMALDEHYDE SOLUTION

Common Synonyms
Formalith
Fyde
Formacin
Formic aldehyde solution
Methanal solution

Watery liquid | Colorless | Irritating odor

Sinks and mixes with water

Vapor forms explosive mixture with air

Wear goggles and self-contained breathing apparatus. Use water spray to reduce vapors or divert vapor cloud drift. Avoid ignition of vapors. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering. Collect for recovery or safe disposal. Emergency responders should wear bunker gear. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or discoloration of tank. ALWAYS stay away from tanks engulfed in fire.

Fire

Combustible

Water, regular foam or carbon dioxide can be used to extinguish fire. Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create explosion hazard. Isolate for 1/2 mile in all directions if tank, rail car or truck is involved in fire.

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
If swallowed, will cause nausea, vomiting or loss of consciousness

Avoid contact with liquid and vapor. Keep upwind. Ventilate closed spaces before entering. Keep out of low areas. Wear goggles and self-contained breathing apparatus. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin or eyes with plenty of water for at least 15 minutes. For minor skin contact, avoid spreading material on unaffected skin. In case of contact with eyes, flush with water continuously. Get medical attention immediately. If victim is breathing, move victim to fresh air. If victim is not breathing, perform artificial respiration, preferably mouth-to-mouth. If victim has ingested material, induce vomiting by touching back of throat with finger or by giving syrup of ipecac. Get medical attention immediately. Do not leave victim unattended. Do not induce vomiting or give anything by mouth if victim is unconscious or convulsing. Keep victim quiet and maintain normal body temperature. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Wash contaminated clothing before reuse. Call a physician immediately.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. Water contaminant. Dispersant flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Formalin, Fyde, Formacin, Methanal, Formic aldehyde

3.2 **Coast Guard Compatibility Classification** Alcohols

3.3 **Chemical Formula** $H_2CHO\ HCOH\ CHOH$

3.4 **IMCO United Nations Numerical Designation** 1198

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent irritating characteristic pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, chemical goggles, protective clothing, synthetic rubber or plastic gloves.

5.2 **Symptoms Following Exposure** INHALATION: Vapor is irritating and will cause coughing, chest pain, nausea and vomiting. INGESTION: Severe nausea, vomiting, abdominal pain and collapse. Contact with skin or eyes causes severe irritation.

5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air. If victim is not breathing, administer artificial respiration. If victim is breathing, administer oxygen if breathing is difficult. INGESTION: Induce vomiting. If victim is conscious and not convulsing, have victim drink water. Induce vomiting by touching back of throat with finger or by giving syrup of ipecac. Get medical attention immediately. Do not induce vomiting or give anything by mouth if victim is unconscious or convulsing. Keep victim quiet and maintain normal body temperature. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. SKIN OR EYES: Flush immediately with plenty of water for at least 15 minutes. Remove and isolate contaminated clothing and shoes. Call a physician for eyes. Wash contaminated clothing before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 2 ppm

5.5 **Short-Term Inhalation Limits** Approximately 20 ppm for 5 min; Approximately 10 ppm for 30 min; 5 ppm for 1 hr

5.6 **Toxicity by Ingestion** Formaldehyde solution Grade 2; LD_{50} Rat 0.5 to 2 g/kg

5.7 **Late Toxicity.** None

5.8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating to eyes, personnel will withdraw from area at moderate high concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Causes severe stinging sensation and first degree burns on short exposure. May cause second degree burns on prolonged exposure.

5.10 **Odor Threshold** 0.05 ppm

6 FIRE HAZARDS

6.1 **Flash Point** 15°F (formaldehyde) Methanol (tech) 152°F C.C. 15% methanol 122°F C.C.

6.2 **Flammable Limits in Air** 7.0% - 73%

6.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide or alcohol foam

6.4 **Fire Extinguishing Agents Not to be Used.** Data not available

6.5 **Special Hazards of Combustion Products** Toxic vapors are generated

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** 806°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** (40% formaldehyde) 30 mg/l Water shrimp 24 hr TL_m fresh water; 32 ppm 24 hr salmon TL_m seawater; 190 ppm 48 hr flounder TL_m salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 37% 5 days 4% theoretical 20 days

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Borden Inc.
   Borden Chemical Division
   50 W. Broad Street
   Columbus Ohio 43215
2. Celanese Corp.
   Celanese Chemical Co. Division
   245 Park Ave.
   New York N.Y. 10017
3. E.I. duPont de Nemours & Co. Inc.
   Industrial & Biochemicals Dept.
   Wilmington Del. 19898

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 37-50% formaldehyde in water containing 0-15% methyl alcohol

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See hazard assessment handbook CG 446-2

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight** 30.03

13.3 **Boiling Point at 1 atm** 96°F (35.6°C)

13.4 **Freezing Point** -15°F (-26°C)

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** 1.02 (Formalin)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** (37% HCHO) Heat of solution -29.2 x 10 Btu/lb

13.16 **Heat of Polymerization** Not pertinent

Continued on page 1/2/3

NOTES

FMA	# FORMIC ACID

Common Synonyms			
Methanoic acid Formylic acid	Liquid	Colorless	Penetrating odor
	Sinks and mixes with water. Freezing point is 47°F		

AVOID CONTACT WITH LIQUID. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber coveralls (including gloves).
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Wear goggles, self-contained breathing apparatus and rubber coveralls (including gloves).
Extinguish with water, dry chemical, carbon dioxide or foam.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (milk).
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give anything by mouth.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Insure adequate ventilation.
Restrict access.
Dilute and flush.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
Methanoic acid
Formylic acid

3.2 **Coast Guard Compatibility Classification**
Organic acid

3.3 **Chemical Formula.** $HCOOH$

3.4 **IMCO United Nations Numerical Designation** 1779

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent, irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Self-contained breathing apparatus, chemical goggles, face shield, rubber suit, gloves, and boots.

5.2 **Symptoms Following Exposure:** Liquid or vapor contact causes severe burns to skin and eyes. Vapor is extremely irritating to eyes, nose, and respiratory system. Ingestion causes severe burning of mouth, throat, and abdomen.

5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air. Keep victim warm and quiet. Get medical attention. INGESTION: DO NOT induce vomiting. Give victim large quantities of water. SKIN OR EYES: Remove victim to safety quickly. Flush affected areas with plenty of water. Get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 1.21 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is extremely irritating to eyes, nose, and respiratory system. Exposure to 150 ppm is dangerous after 30 minutes.

5.9 **Liquid or Solid Irritant Characteristics.** Liquid causes severe burns to skin and eyes. Prolonged contact may cause second degree burns. Concentrations greater than 10% are severely irritating to skin.

5.10 **Odor Threshold.** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point.** 156°F OC

6.2 **Flammable Limits in Air.**
Data not available

6.3 **Fire Extinguishing Agents:** Water, carbon dioxide, dry chemical or alcohol foam.

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.

6.5 **Special Hazards of Combustion Products.** Toxic gases and vapors may be released in a fire involving formic acid.

6.6 **Behavior in Fire:** Not pertinent.

6.7 **Ignition Temperature:** 1004°F

6.8 **Electrical Hazard.** Not pertinent.

6.9 **Burning Rate:** 0.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.

7.2 **Reactivity with Common Materials:** No reaction.

7.3 **Stability During Transport.** Stable.

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, then neutralize with lime.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 130 mg/l 24 hr bluegill TL_m fresh water; 120 ppm 48 hr daphnia TL_m fresh water.

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD)**
2 days 40%, other 5 days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. E I duPont de Nemours & Co. Inc.
Industrial & Biochemicals Dept.
Wilmington, Del. 19898

2. Meddlesome Chemical Co.
Como, Miss. 38624

3. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity.** Technical, pharmaceutical, 88-98%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

XPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Short Exposure	3
Liquid or Solid Contact	3
Poisons	1
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effects	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 46.03

13.3 **Boiling Point at 1 atm**
214°F = 101°C = 374°K

13.4 **Freezing Point:** 47°F = 8.4°C = 281.5°K

13.5 **Critical Temperature:** No data found

13.6 **Critical Pressure:** No data found

13.7 **Specific Gravity:** 1.220 at 20°C (liquid)

13.8 **Liquid Surface Tension**
Data not available

13.9 **Liquid-Water Interfacial Tension**
No data found

13.10 **Vapor (Gas) Specific Gravity:**
No data found

*13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.3

13.12 **Latent Heat of Vaporization**
At Boiling Point: 0.202 BTU/lb = 0.112 kcal/g = 112 cal/g

13.13 **Heat of Combustion:** -1035 BTU/lb = -5750 cal/g = -241 x 10^3 J/kg

13.14 **Heat of Decomposition:** No data found

13.15 **Heat of Solution:** -207 BTU/lb = -115 cal/g = -483 x 10^3 J/kg

13.16 **Heat of Polymerization:** No data found

* = New or revised data

NOTES

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FUM — FUMARIC ACID

Common Synonyms	Solid	White	Odorless
Trans-Butenedioic acid Allomaleic acid Trans-1,2-ethylenedicarboxylic acid Boletic acid Lichenic acid	Sinks and mixes with water		

Stop discharge if possible. Keep ignition sources away.
Shut off ignition sources. Call fire department.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Dust cloud may explode if ignited in an enclosed area
Irritating gases may be produced when heated
Extinguish with water fog, foam, or carbon dioxide

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Allomaleic acid
Boletic acid *trans* Butenedioic acid
trans 1,2 Ethylenedicarboxylic acid
Lichenic acid

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** HO CH=CH CO-H

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, gloves, safety glasses, dust cap

5 2 **Symptoms Following Exposure:** Inhalation of dust may cause respiratory irritation. Compound is non toxic when ingested. Prolonged contact with eyes or skin may cause irritation.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water, get medical attention if irritation persists. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water spray, dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products.** Irritating fumes of maleic anhydride may form in fires

6 6 **Behavior in Fire:** Dust presents explosion hazard. Knock down dust with water fog

6 7 **Ignition Temperature.** 1364°F (powder)

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** 61% 5 days

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Tenneco Chemicals Inc.
Intermediates Div.
Turner Place
P O Box 2
Piscataway, N J 08854

2 Pfizer Inc
Chemicals Div
235 East 42 St
New York, N Y 10017

3 Monsanto Company
800 North Lindbergh Blvd
St Louis, Mo 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
Purified food grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 116.07

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.635 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −4 970 Btu lb = −2 760 cal g = −116 × 10 J kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

FFA

FURFURAL

Common Synonyms
Pyromucic aldehyde
2-Furaldehyde
Furfuraldehyde
Fural

Oily liquid | Colorless to reddish-brown | Almond odor

Sinks in water

Avoid contact with liquid. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber protective clothing (including gloves).
Call fire department.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Wear goggles, self-contained breathing apparatus and rubber protective clothing including gloves.
Extinguish with water, dry chemical, alcohol foam, carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. Have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give anything by mouth.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify public health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-6

Issue warning: water contaminated
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
2-Furaldehyde, Furfuraldehyde, Furol, Pyromucic aldehyde, Furfurole, Quakeral

3.2 **Coast Guard Compatibility Classification**
Inhibited

3.3 **Chemical Formula**
$OCHCHCHCHO$

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color:** Colorless to reddish-brown
4.3 **Odor:** Almond like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** See reference section
5.2 **Symptoms Following Exposure** Vapor causes irritation of eyes, respiratory tract and skin. Liquid causes severe burns to eyes and skin.
5.3 **Treatment for Exposure** INHALATION: Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Keep victim warm and quiet. Get medical attention. INGESTION: Induce vomiting. Keep victim warm and quiet. Get medical attention. SKIN AND MUCOUS MEMBRANES: Flush affected areas with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 2 ppm
5.5 **Short-Term Inhalation Limits** Data not available
5.6 **Toxicity by Ingestion** Oral LD50 (rat) 50 mg/kg
5.7 **Late Toxicity:** Causes liver damage in rats
5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes irritation to eyes, which persists a short time after exposure. Does not have unpleasant or irritating warning properties.
5.9 **Liquid or Solid Irritant Characteristics.** Causes severe burning pain and tissue destruction. Higher exposures may cause permanent damage to eyes.
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 140°F (60°C) TOC
6.2 **Flammable Limits in Air:**
2.1% - 19.3%
6.3 **Fire Extinguishing Agents.** Water fog, foam, carbon dioxide, dry chemical, or alcohol foam.
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 739°F
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** 2.6 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
24 ppm 96-hr bluegill TLm fresh water
32 ppm 24-hr sunfish TLm fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.28 - 0.77 lb/lb in 5 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

The Quaker Oats Co.
Chemicals Division
Merchandise Mart Plaza
Chicago, Illinois

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Toxicity	2
Liquid or Solid Contact	2
Poison	0
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 96.08
13.3 **Boiling Point at 1 atm**
323°F = 161.7°C = 434.8°K
13.4 **Freezing Point.**
-34°F = -36.5°C = 236.7°K
13.5 **Critical Temperature**
[illegible]
13.6 **Critical Pressure.**
[illegible]
13.7 **Specific Gravity:** 1.16 at 20°/20°C
13.8 **Liquid Surface Tension.**
[illegible]
13.9 **Liquid-Water Interfacial Tension**
[illegible]
13.10 **Vapor (Gas) Specific Gravity:**
No data
13.11 **Ratio of Specific Heats of Vapor (Gas):**
No data
13.12 **Latent Heat of Vaporization**
[illegible]
13.13 **Heat of Combustion** -1040 BTU/lb = -2418 kJ/mole
13.14 **Heat of Decomposition** No data
13.15 **Heat of Solution** No data
13.16 **Heat of Polymerization** No data

NOTES

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FAL — FURFURYL ALCOHOL

Common Synonyms
2-Furanmethanol
Furfurakohol
2-Furylcarbinol
2-Hydroxymethylfuran

Liquid | Colorless to light yellow | Mod irritating

Mixes with water

Stop discharge if possible. Keep people away.
Call fire dept. if fire.
Evacuate area if vapor discharged in storage.
No [illegible] and gas [illegible]

Fire

Combustible

[illegible]

Exposure

[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contamination
Disperse and flush

2. LABELS

No label required by Coast Guard Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** 2-Furanmethanol
Furfurakohol alpha-Furylcarbinol
2-Furylcarbinol 2-Hydroxymethylfuran

3.2 **Coast Guard Compatibility Classification.** [illegible]

3.3 **Chemical Formula.** $C_5H_6O_2$

3 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless or amber

4.3 **Odor.** Mildly irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes headache, nausea and irritation of nose and throat. Vapor irritates eyes. Ingestion causes headache, nausea, vomiting, diarrhea. Liquid causes dryness and cracking. Ingestion causes headache, nausea, vomiting, diarrhea, burning of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. Treat for shock if necessary. Call physician at once. If breathing has stopped, give artificial respiration. EYES: irrigate with plenty of water for at least 15 minutes, get medical attention. SKIN: wash promptly with soap and water. INGESTION: induce vomiting if victim is conscious. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention promptly.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits** [illegible]

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Vapor [illegible] irritation which may progress to [illegible]. Such concentrations are not likely to be encountered. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Liquid may cause slight to moderate irritation if allowed to remain on skin. Severe smarting and reddening of skin.

5.10 **Odor Threshold.** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point.** [illegible]°F (O.C.) [illegible]°C

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents.** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** [illegible]

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Data on acid forms; water-soluble materials on exposure to air; avoids part[illegible] when hot

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. The Quaker Oats Company
Chemicals Division
345 Merchandise Mart Plaza
Chicago, IL 60654

2. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

3. Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NPO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicants	2
Aquatic Toxicants	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 98.1

13.3 **Boiling Point at 1 atm:**
338°F = 170°C = 443°K

13.4 **Freezing Point:** [illegible]°F = -15°C = 258°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.13 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
38 dynes/cm = 0.038 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 3.4

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization:** 230 Btu/lb
= 130 cal/g = 5.4 × 10⁵ J/kg

13.13 **Heat of Combustion:** -11,200 Btu/lb
= -6,200 cal/g = -260 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

GLA GALLIC ACID

Common Synonyms
3,4,5-Trihydroxybenzoic acid
Gallic acid monohydrate

Solid | White | Odorless

Sinks in water

Stop discharge if possible. Keep people away.
Shut off ignition sources. Call fire department.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with water, dry chemicals, foam, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.

If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Gallic acid monohydrate; 3,4,5-Trihydroxybenzoic acid
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $3,4,5\text{-}(HO)_3C_6H_2COOH\cdot H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Bu Mines approved respirator, rubber gloves, safety goggles
5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 10 min., consult a physician if irritation persists. SKIN: wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 - 5 g/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:**
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
96 hr TLm ppm 6-hr minnow MED fresh water
48 hr TLm 20 ppm 6-hr minnow MED fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** 8% 5 days
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 The Harshaw Chemical Co
1945 E 97 St
Cleveland, Ohio 44106

2 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee, Wis 53233

3 Eastman Organic Chemicals
Rochester, N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** N F Practical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

HSS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** 188
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.7 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** -6.060 Btu lb = -3.370 cal g = -14.1 × 10^3 J kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

GOC	# GAS OIL: CRACKED

Common Synonyms	Liquid	Colorless	Gasoline-like odor
	Floats on water		

Stop discharge if possible. Keep [illegible]
Call fire department.
Isolate and remove discharged material.
[illegible]

Fire

Combustible
[illegible] carbon dioxide

Exposure

CALL FOR MEDICAL AID

LIQUID
Harmful if swallowed.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water [illegible]
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Floating to shoreline
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook. (1-446-4)

Mechanical containment
Should be removed
Physical and chemical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
No common synonyms

3 2 **Coast Guard Compatibility Classification:**
Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not pertinent (mixture)

3 4 **IMCO-United Nations Numerical Designation:** 3 3 1202 (gas oil)

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Yellow to brown

4 3 **Odor:** Like gasoline and petroleum

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective goggles, gloves

5 2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract, stimulation, then depression, dizziness, headache, incoordination, anesthesia, coma, respiratory arrest, irregular heartbeat, as complications. ASPIRATION causes severe coughing, gagging, distress, rapid development of pulmonary edema. INGESTION causes irritation of throat and stomach, stimulation, then depression.

5 3 **Treatment for Exposure:** Get medical attention. INHALATION: maintain respiration, administer oxygen if needed. ASPIRATION: enforce bed rest and administer oxygen. INGESTION: give victim water or milk; do NOT induce vomiting; guard against aspiration of vomit. EYES: wash with copious quantities of water. SKIN: remove by wiping, then wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** No single value applicable

5 5 **Short-Term Inhalation Limits:** Not pertinent.

5 6 **Toxicity by Ingestion:** Grade 3. LD50 [illegible] g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Repeated or prolonged and allowed to remain may cause smarting and reddening of skin.

5 10 **Odor Threshold:** 0.25 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** [illegible] C C

6 2 **Flammable Limits in Air:**
[illegible]

6 3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent.

6 7 **Ignition Temperature:** 648°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
[illegible] ppm/24 hr/[illegible]/shad/[illegible]/fresh water
[illegible] ppm/24 hr/[illegible]/shad/[illegible]/salt water

8 2 **Waterfowl Toxicity:**
Data not available

8 3 **Biological Oxygen Demand (BOD)**
[illegible] days

8 4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1 Exxon Co.
[illegible] Rockefeller Plaza
New York, N.Y. [illegible]

2 Shell Oil Co.
[illegible] Shell Plaza
Houston, Texas [illegible]

3 Sun Oil Co.
[illegible] Dawson, Pa. [illegible]

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Composition varies widely with specific operation involved

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook. (4-446-3)

A I C

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	*
Health	
Vapor Irritant	
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	*
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	*
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** [illegible] °F = [illegible] °C = [illegible] °K

13 4 **Freezing Point:** No [illegible]

13 5 **Critical Temperature:** No [illegible]

13 6 **Critical Pressure:** No [illegible]

13 7 **Specific Gravity:** 0.848 16°C (liquid)

13 8 **Liquid Surface Tension:**
[illegible] dynes/cm = 0.025 N/m = Not [illegible]

13 9 **Liquid-Water Interfacial Tension:**
[illegible] dynes/cm = 0.035 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** [illegible]

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization.**
No [illegible]

13 13 **Heat of Combustion:** -18,400 Btu/lb = -10,200 cal/g = 428 × 10³ J/kg

13 14 **Heat of Decomposition:** No [illegible]

13 15 **Heat of Solution:** No [illegible]

13 16 **Heat of Polymerization.** Not pertinent

[illegible]

NOTES

REVISED 1978

GAT GASOLINES: AUTOMOTIVE
(< 4.23g lead/gal)

Common Synonyms

Water: liquid Colorless to pale brown or pink Gasoline odor

Floats on water. Flammable; irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon materials
3.3 Chemical Formula
3.4 IMCO United Nations Numerical Designation

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)
4.2 Color:
4.3 Odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INHALATION; INGESTION; EYES; SKIN
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits
5.6 Toxicity by Ingestion
5.7 Late Toxicity
5.8 Vapor (Gas) Irritant Characteristics
5.9 Liquid or Solid Irritant Characteristics
5.10 Odor Threshold

6 FIRE HAZARDS

6.1 Flash Point.
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents.
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire
6.7 Ignition Temperature:
6.8 Electrical Hazard.
6.9 Burning Rate

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water
7.2 Reactivity with Common Materials:
7.3 Stability During Transport
7.4 Neutralizing Agents for Acids and Caustics
7.5 Polymerization
7.6 Inhibitor of Polymerization

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

*10.1 Grades or Purity:
*10.2 Storage Temperature:
*10.3 Inert Atmosphere
*10.4 Venting:

11 HAZARD ASSESSMENT CODE

NFSW

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating

12.3 NFPA Hazard Classifications:

Category	Classification

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm:
*13.2 Molecular Weight:
*13.3 Boiling Point at 1 atm:
*13.4 Freezing Point:
*13.5 Critical Temperature:
*13.6 Critical Pressure:
*13.7 Specific Gravity: 0.721 at 20°C (liquid)
13.8 Liquid Surface Tension
13.9 Liquid-Water Interfacial Tension.
*13.10 Vapor (Gas) Specific Gravity:
*13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization
13.13 Heat of Combustion
13.14 Heat of Decomposition
13.15 Heat of Solution:
13.16 Heat of Polymerization

NOTES

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GAV — GASOLINES: AVIATION
(< 4.86g lead/gal)

Common Synonyms

Waters liquid Red blue green brown or purple Gasoline odor

Floats on water. Flammable irritating vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification. Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure: INHALATION ... ASPIRATION ... INGESTION ... EYES ... SKIN ...
5.3 Treatment for Exposure: INHALATION ... ASPIRATION ... INGESTION ... EYES ... SKIN ...
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: None
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to source of ignition and flash back.
6.7 Ignition Temperature:
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Exxon Co.
Rockefeller Plaza
New York, N.Y.

Mobil Oil Co.
Mobil Plaza
Box
Texas

Sunoco
Sunoco Plaza

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

A T E V W

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations. Flammable liquid
12.2 NAS Hazard Rating for Bulk Water Transportation.

Category	Rating
F	
H	
Vapor	
Liquid	
Water	
W	
Human	
Aquatic	
Aquatic	
R	
S	
R	

12.3 NFPA Hazard Classifications.

Category	Classification
Health Hazard	
Flammability	Red
Reactivity	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity: 0.71 at 15°C (liquid)
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization.
13.13 Heat of Combustion.
13.14 Heat of Decomposition.
13.15 Heat of Solution.
13.16 Heat of Polymerization.

5 HEALTH HAZARDS (Cont'd)

5.9 Vapor (Gas) Irritant Characteristics.
5.9 Liquid or Solid Irritant Characteristics.
5.10 Odor Threshold

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GAK	GASOLINE BLENDING STOCKS: ALKYLATES

Common Synonyms

Water: liquid Colorless Gasoline odor

Floats on water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away. Shut off ignition sources and all fire detection systems. Stay upwind and ashore. Keep out of water. Ventilate area. Remove discharged material. Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, CO2, water spray or foam.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea and vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, do not induce vomiting. Give large quantities of water. Call physician immediately.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Foaming in shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Water Pollution Hazardous Substances Handbook, CG-446-2

Evacuate area. Keep upwind.
Dike spill.
Dilute with water.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Mixture
3.4 **IMCO United Nations Numerical Designation:** None

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Gasoline odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus. Protective clothing. Gloves.

5.2 **Symptoms Following Exposure:** INHALATION: Irritation of eyes, nose and throat. Dizziness, headache, difficult breathing or loss of consciousness. Nausea and vomiting. ASPIRATION: Irritation of lungs. Pneumonitis. Pulmonary edema. Chemical pneumonitis. Can be fatal. INGESTION: Irritation of mouth, throat and stomach. Nausea and vomiting. Diarrhea. Abdominal pain. Dizziness. Headache. Drowsiness. Loss of consciousness. Can be fatal.

5.3 **Treatment for Exposure:** None. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. ASPIRATION: Get medical attention immediately. INGESTION: Do not induce vomiting. Give large quantities of water. Get medical attention immediately. EYES: Flush with plenty of water. SKIN: Wash with soap and water. Remove contaminated clothing and shoes.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** None. TLV-TWA: 300 ppm

5.5 **Short Term Inhalation Limits:** 500 ppm for 1 hr

5.6 **Toxicity by Ingestion:** Grade 2: Moderately Toxic

5.7 **Late Toxicity:** None

6 FIRE HAZARDS

6.1 **Flash Point:** (a) -50°F C.C. (b) -45°F C.C.

6.2 **Flammable Limits in Air:** (a) 1.1% (b) 7.1%

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.

6.5 **Special Hazards of Combustion Products:** None

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Class I, group D

6.9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 96-hour TLm fresh water: Data not available. 96-hour TLm salt water: Data not available.

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Texaco Inc.
   905 Realtor Plaza
   New York, N.Y. 10055
2. Shell Oil Co.
   Shell Plaza
   Houston, Tex. 77001
3. Sun Oil Co.
   N. Broad St.
   Philadelphia, Pa. 19103

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial grade with aromatic content not specified

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open or pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A T L V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poison	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not applicable
13.3 **Boiling Point at 1 atm:** 100°F to 400°F
13.4 **Freezing Point:** Not applicable
13.5 **Critical Temperature:** Not applicable
13.6 **Critical Pressure:** Not applicable
13.7 **Specific Gravity:** 0.65 to 0.80 at 60°F/60°F (liquid)
13.8 **Liquid Surface Tension:** Not applicable
13.9 **Liquid-Water Interfacial Tension:** Not applicable
13.10 **Vapor (Gas) Specific Gravity:** 3.4
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not applicable
13.12 **Latent Heat of Vaporization:** 130 BTU/lb. at 60°F
13.13 **Heat of Combustion:** -20,500 BTU/lb.
13.14 **Heat of Decomposition:** Not applicable
13.15 **Heat of Solution:** Not applicable
13.16 **Heat of Polymerization:** Not applicable

5 HEALTH HAZARD (Cont'd)

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. Practically non-irritating.

5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. Repeated or prolonged contact may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.5 ppm

REVISED 1978

GRF — GASOLINE BLENDING STOCKS: REFORMATES

Common Synonyms

Watery liquid | Colorless | Gasoline odor

Floats on water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not pertinent
3 4 **IMCO/United Nations Numerical Designation.** 3 1 3 2/1203

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective goggles, gloves.

5 2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache and incoordination to anesthesia, coma, and respiratory arrest. Irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema. Later signs of bronchopneumonia and pneumonitis, acute onset of central nervous system followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach, stimulation followed by depression of central nervous system, irregular heartbeat.

5 3 **Treatment for Exposure:** Seek medical attention. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, administer oxygen. INGESTION: do NOT induce vomiting, lavage carefully if appreciable quantity was ingested, guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** No single TLV applicable.

5 5 **Short-Term Inhalation Limits:** 500 ppm for 30 min.

5 6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg.

5 7 **Late Toxicity:** None.

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

6 FIRE HAZARDS

6 1 **Flash Point.**
(a) <0 [ ] C
(b) 0.73°[ ] C

6 2 **Flammable Limits in Air:**
(a) 1 Pc 8 Pc

6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide.

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective.

6 5 **Special Hazards of Combustion Products:** None.

6 6 **Behavior in Fire.** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.

6 7 **Ignition Temperature.** Data not available.

6 8 **Electrical Hazard.** Class I, group D.

6 9 **Burning Rate:** 4 mm/min.

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction.

7 2 **Reactivity with Common Materials:** No reaction.

7 3 **Stability During Transport.** Stable.

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent.

7 5 **Polymerization.** Not pertinent.

7 6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
90 ppm/24 hr/juvenile American shad/TL_m/fresh water
91 ppm/24 hr/juvenile American shad/TL_m/salt water

8 2 **Waterfowl Toxicity.** Data not available.

8 3 **Biological Oxygen Demand (BOD).** [illegible] days

8 4 **Food Chain Concentration Potential.** None.

9. SELECTED MANUFACTURERS

1 Exxon Co
30 Rockefeller Plaza
New York, N Y 10020

2 Shell Oil Co
1 Shell Plaza
Houston, Texas 77001

3 Sun Oil Co
St Davids, Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Composition varies with range of distillation temperatures used.

10 2 **Storage Temperature.** Ambient.

10 3 **Inert Atmosphere.** No requirement.

10 4 **Venting:** Open flame arrester or pressure vacuum.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U-V-W

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable liquid.

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid.

13 2 **Molecular Weight.** Not pertinent.

13 3 **Boiling Point at 1 atm.** 58 - 275°F = 14 - 135°C = 287 - 408°K

13 4 **Freezing Point:** Not pertinent.

13 5 **Critical Temperature:** Not pertinent.

13 6 **Critical Pressure:** Not pertinent.

13 7 **Specific Gravity:** 0.7934 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 19 - 23 dynes/cm = 0.019 - 0.023 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** 49 - 51 dynes/cm = 0.049 - 0.051 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 3.4

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent.

13 12 **Latent Heat of Vaporization.** 130 - 150 Btu/lb = 71 - 83 cal/g = 3.0 - 3.4 × 10^5 J/kg

13 13 **Heat of Combustion:** −18,720 Btu/lb = −10,400 cal/g = −435.4 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent.

13 15 **Heat of Solution:** Not pertinent.

13 16 **Heat of Polymerization:** Not pertinent.

5 HEALTH HAZARDS (Cont'd)

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** 0.25 ppm

GCS GASOLINES: CASINGHEAD

Common Synonyms	Watery liquid	Colorless	Gasoline odor
	Floats on water	Flammable, irritating vapor is produced	

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

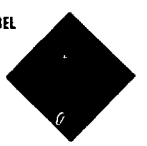
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4)

Issue warning - high flammability
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Natural gasoline
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO/United Nations Numerical Designation:** 3.1-1278

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Gasoline

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles, gloves.

5.2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest. Irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema. Later signs of bronchopneumonia and pneumonitis. Acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach, stimulation followed by depression of central nervous system, irregular heartbeat.

5.3 **Treatment for Exposure:** Seek medical attention. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantities of water. SKIN: wipe off and wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** No single TLV applicable.

5.5 **Short-Term Inhalation Limits:** 500 ppm for 30 min.

5.6 **Toxicity by Ingestion:** Grade 2, LD$_{50}$ 0.5 to 5 g/kg

5.7 **Late Toxicity:** None

6 FIRE HAZARDS

6.1 **Flash Point:** <0 F (-18 C)
6.2 **Flammable Limits in Air:** 1.4-7.6%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to source of ignition and flash back.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Class I, group D
6.9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
90 ppm/24 hr/juvenile American shad/11 m/fresh water
91 ppm/24 hr/juvenile American shad/11 m/salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** No data
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Co.
30 Rockefeller Plaza
New York, N.Y. 10020
2. Shell Oil Co.
1 Shell Plaza
Houston, Texas 77001
3. Sun Oil Co.
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Composition depends on location of oil well
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3)

A.T.U.V-W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm.**
90-258 F = 14-126 C = 287-399 K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.671 at 15°C (liquid)
13.8 **Liquid Surface Tension:** 19-23 dynes/cm = 0.019-0.023 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 49-51 dynes/cm = 0.049-0.051 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.4
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 130-150 Btu/lb = 71-83 cal/g = 3.0-3.4 × 10^5 J/kg
13.13 **Heat of Combustion:** -18,720 Btu/lb = -10,400 cal/g = -435.4 × 10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

5 HEALTH HAZARDS (Cont'd)

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor may cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.25 ppm

REVISED 1978

GPL

GASOLINES: POLYMER

Common Synonyms

Watery liquid | Colorless | Gasoline odor

Floats on water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headaches, difficult breathing or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

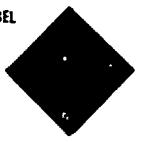
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Evacuate area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms.
3.2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO United Nations Numerical Designation:** 3.2/1215

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Gasoline

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles, gloves.

5.2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache and incoordination to anesthesia, coma and respirators arrest, irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress and rapidly developing pulmonary edema, later signs of bronchopneumonia and pneumonitis, acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus and stomach, stimulation followed by depression of central nervous system, irregular heartbeat.

5.3 **Treatment for Exposure:** Seek medical attention. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, administer oxygen. INGESTION: do NOT induce vomiting, lavage carefully if appreciable quantities was ingested, guard against aspiration into lungs. EYES: wash with copious quantities of water. SKIN: wipe off and wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** No single TLV applicable

5.5 **Short-Term Inhalation Limits:** 500 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.

6. FIRE HAZARDS

6.1 **Flash Point:** -0.73°F (-53°C)
6.2 **Flammable Limits in Air.** 1.4% - 7.6%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard.** Class I, group D
6.9 **Burning Rate.** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
90 ppm/24 hr/juvenile American shad/TL_m/fresh water
91 ppm/24 hr/juvenile American shad/TL_m/salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** No. days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Exxon Co.
30 Rockefeller Plaza
New York, N.Y. 10020
2. Shell Oil Co.
1 Shell Plaza
Houston, Texas 77001
3. Sun Oil Co.
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Composition varies with range of distillation temperatures used. Contains mainly isohexane substance
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester or pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V-T-L-A-W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** 58 - 275°F = 14 - 135°C = 287 - 408°K
13.4 **Freezing Point.** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.71 - 0.78 at 15°C (liquid)
13.8 **Liquid Surface Tension:** 19 - 23 dynes/cm = 0.019 - 0.023 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 40 - 51 dynes/cm = 0.040 - 0.051 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.4
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 130 - 150 Btu/lb = 72 - 83 cal/g = 3.0 - 3.4 × 10⁵ J/kg
13.13 **Heat of Combustion:** -18,720 Btu/lb = -10,400 cal/g = -435.4 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 with 5

5 HEALTH HAZARDS (Cont'd)

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause scarring and reddening of the skin.
5.10 **Odor Threshold:** 0.25 ppm

REVISED 1978

GSR

GASOLINES: STRAIGHT RUN

Common Synonyms	Watery liquid Colorless Gasoline odor Floats on water Flammable, irritating vapor is produced
	FLAMMABLE. Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness LIQUID Irritating to skin and eyes If swallowed, will cause nausea or vomiting.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula.** Not pertinent

3 4 **IMCO/United Nations Numerical Designation:** UN 1 2 1203

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective goggles, gloves

5 2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract + central nervous system stimulation followed by depression of same degrees ranging from dizziness, headache and incoordination to anesthesia, coma and respiratory arrest, irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema later signs of bronchopneumonia and pneumonitis, acute onset of central nervous system involvement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus and stomach, stimulation followed by depression of central nervous system, irregular heartbeat.

5 3 **Treatment for Exposure:** Seek medical attention. INHALATION maintain respiration, give oxygen if needed. ASPIRATION emergency bed, administer oxygen. INGESTION do NOT induce vomiting, lavage carefully, if appreciable amount was ingested, guard against aspiration into lungs. EYES wash with large quantities water. SKIN wipe off and wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Single TLV applicable

5 5 **Short-Term Inhalation Limits:** 500 ppm (1)

5 6 **Toxicity by Ingestion:** Grade 2 LD(50)

5 7 **Late Toxicity:** None

6 FIRE HAZARDS

6 1 **Flash Point:**
(a) <0°F (-18°C)
(b) 0-73°F (-18 to 23°C)

6 2 **Flammable Limits in Air:**
(a) 1.4% - 7.6%

6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** None

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Class I, Group D

6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
90 ppm/24 hr/juvenile American shad
TL(m)/fresh water
91 ppm/24 hr/juvenile American shad
TL(m)/salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 8% 5 days

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Exxon Co
30 Rockefeller Plaza
New York, N.Y. 10020

2 Shell Oil Co
1 Shell Plaza
Houston, Texas 77001

3 Sun Oil Co
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Composition varies with range of distillation temperatures used

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T L X-W

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** 90-220°F = 32-104°C = 305-377°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.71 - 0.77 at 15°C (liquid)

13 8 **Liquid Surface Tension:** 19-23 dynes/cm = 0.019-0.023 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** 49-51 dynes/cm = 0.049-0.051 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 3-4

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 130-150 Btu/lb = 72-83 cal/gm = 3.0-3.4 × 10⁵ J/kg

13 13 **Heat of Combustion:** -18,720 Btu/lb = -10,400 cal/gm = -43.6 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

5. HEALTH HAZARDS (Cont'd)

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** 0.25 ppm

REVISED 1978

GTA GLUTARALDEHYDE SOLUTION

Common Synonyms
1,5-Pentanedial

Liquid Light yellow

Mixes with water

Stop discharge if possible. Keep people away
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

Call for medical aid

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: water contaminant
Restrict access
Disperse and flush

2. LABELS

No label required, by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** 1,5-Pentanedial solution
3.2 **Coast Guard Compatibility Classification:** Aldehyde
3.3 **Chemical Formula.** $OHC-(CH_2)_3-CHO$ (in water)
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Pale yellow
4.3 **Odor:** Like rotten apples

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves
5.2 **Symptoms Following Exposure:** Contact with liquid causes severe irritation of eyes and irritation of skin. Chemical readily penetrates skin in harmful amounts. Ingestion causes irritation of mouth and stomach
5.3 **Treatment for Exposure:** EYES: immediately flush with plenty of water for at least 15 min; get medical attention. SKIN: immediately flush with plenty of water for at least 15 min. INGESTION: give large amounts of water and induce vomiting; get medical attention
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; oral rat LD_{50} = 1.36 mg/kg
5.7 **Late Toxicity:** Induces contact dermatitis in some people
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Non flammable solution
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017
2. Polysciences, Inc.
Paul Valles Industrial Park
Warrington, Pa. 18976

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 25% aqueous solution
50% aqueous solution
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

[illegible]
A-P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Mixture
13.3 **Boiling Point at 1 atm:**
>212°F = >100°C = >373°K
13.4 **Freezing Point.**
<32°F (0°C = <266°K
13.5 **Critical Temperature:** [illegible]
13.6 **Critical Pressure.** Not pertinent
13.7 **Specific Gravity:**
1.062 - 1.124 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.)
<80 dynes/cm = <0.080 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.12 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

GCR

GLYCERINE

Common Synonyms
1,2,3-Propanetriol
1,2,3-Trihydroxypropane
Glycerol

Oily liquid | Colorless | Odorless

Sinks and mixes with water. Freezing point is 64° F

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-6

Dispersal and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
Glycerol
1,2-Propanetriol
1,2,3-Trihydroxypropane

3.2 **Coast Guard Compatibility Classification.**
Alcohol

3.3 **Chemical Formula:**
$HOCH_2CHOHCH_2OH$

3.4 **IMCO United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles

5.2 **Symptoms Following Exposure:** No hazard

5.3 **Treatment for Exposure:** No hazard

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Adult LD[50] above 5 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is practically nonirritating to eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to skin

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 160°F (O.C.) 320°F (C.C.)

6.2 **Flammable Limits in Air:**
Not pertinent

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide, water fog

6.4 **Fire Extinguishing Agents Not to be Used:**
Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:**
Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 698°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available

8.2 **Waterfowl Toxicity:**
Data not available

8.3 **Biological Oxygen Demand (BOD)**
20% (theor.) 5 days

8.4 **Food Chain Concentration Potential.**
None

9 SELECTED MANUFACTURERS

1. Lever Brothers Co
390 Park Ave
New York, N.Y. 10022
2. Procter & Gamble Co
301 East Sixth St
Cincinnati, Ohio 45201
3. Shell Chemical Co
Industrial Chemicals Division
Houston, Tex. 77001

10 SHIPPING INFORMATION

10.1 **Grades of Purity:**
CP 99.5+, USP 99.5

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame pressure or vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A.P.Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 92.10

13.3 **Boiling Point at 1 atm:**
554°F = 290°C = 563°K

13.4 **Freezing Point.**
64°F = 18°C = 291°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.26 at 20°C (liquid)

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization:**
288 Btu/lb = 160 cal/g = 670 J/g

13.13 **Heat of Combustion.** -7.8 kBtu/lb
= -4.3 kcal/g = -18.0 kJ/g

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 77.9 Btu/lb
= 43.3 cal/g = 181.4 J/g

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 under

NOTES

GCM	# GLYCIDYL METHACRYLATE

Common Synonyms
Glycidyl alpha-methyl acrylate
Methacrylic acid 2,3-epoxy propyl ester

Liquid — Colorless — Fruity odor

Floats on water

Avoid contact with liquid. Keep people away.
Wear rubber overclothing including gloves.
Call fire department.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and wild[illegible] officials.

Fire

Combustible
Wear goggles, self-contained breathing apparatus and rubber overclothing including gloves.
Extinguish with foam, dry chemical, carbon dioxide.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID
LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wild[illegible] officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-6

Mechanical containment.
Should be removed.
Chemical and physical treatment.

2 LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Glycidyl alpha-methyl acrylate; Methacrylic acid 2,3-epoxypropyl ester
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $CH_2C(CH_3)COOCH_2CHCH_2O$
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Polyethylene coated apron and gloves and chemical goggles.
5.2 **Symptoms Following Exposure:** The liquid irritates eyes about as much as soap. Prolonged contact with skin produces irritation and dermatitis.
5.3 **Treatment for Exposure:** SKIN: wash thoroughly with soap and water and treat as a chemical burn. EYES: irrigate with clear water for 15 min. and get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2. LD_{50} 0.5 to 5 g/kg (rats)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is mildly irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and 1st degree burns on short exposure; may cause secondary burns on long exposure. In eyes the irritation is similar to that caused by ordinary soap.
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] C
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Data not available
6.4 **Fire Extinguishing Agents Not to be Used:** Data not available
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Heat, peroxides and caustics all cause polymerization; the reaction is not considered hazardous.
7.6 **Inhibitor of Polymerization:** Hydroquinone monomethyl ether; copper

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Nicolas, Inc.
1400 Fairfield Rd.
Baltimore, Md. 21226
2. American Amine & Extract Co., Inc.
Venango and N. St.
Philadelphia, Pa. 19134
Polysciences, Inc.
Warrington, Pa. 18976

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 92%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-[illegible]

NTEAYZ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 142
13.3 **Boiling Point at 1 atm:** 189°C
13.4 **Freezing Point:** Data not available
13.5 **Critical Temperature:** No data
13.6 **Critical Pressure:** No data
13.7 **Specific Gravity:** 1.042 at 20°C/4°C
13.8 **Liquid Surface Tension:** 32 dynes/cm at 20°C
13.9 **Liquid-Water Interfacial Tension:** 10 dynes/cm at 20°C
13.10 **Vapor (Gas) Specific Gravity:** No data
13.11 **Ratio of Specific Heats of Vapor (Gas):** No data
13.12 **Latent Heat of Vaporization:** No data
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** No data
13.15 **Heat of Solution:** No data
13.16 **Heat of Polymerization:** [illegible]

continued on page [illegible]

NOTES

GOS	# GLYOXAL, 40% SOLUTION

Common Synonyms			
Biformyl Diformyl Ethanedial Oxal Oxaldehyde	Liquid	Light yellow	Weak sour odor
	Mixes with water		

Stop discharge if possible. Keep people away.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

Call for medical aid.

LIQUID

Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-6)

Issue warning - water contaminant.
Disperse and flush.

2. LABELS

No label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Biformal, Biformyl, Diformyl, Ethanedial, Oxal, Oxaldehyde

3.2 **Coast Guard Compatibility Classification:** To be developed

3.3 **Chemical Formula:** $C_2H_2O_2$ ($CHOCHO$ in water)

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Pale yellow

4.3 **Odor:** Weak sour

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves.

5.2 **Symptoms Following Exposure:** Inhalation causes some irritation of nose and throat. Contact with liquid irritates eyes, and causes mild irritation of skin; stains skin yellow. (No information available on symptoms of ingestion.)

5.3 **Treatment for Exposure:** INHALATION: remove from exposure. EYES or SKIN: flood with water for 15 min. INGESTION: no information on treatment.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3; oral rat LD_{50}: 2020 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Non-flammable solution

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Heat may cause polymerization to a combustible viscous material

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Corrosive to most metals. The reaction is slow.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
   Chemicals and Plastics Division
   270 Park Avenue
   New York, N.Y. 10017
2. Eastman Kodak Co.
   Eastman Organic Products
   Rochester, N.Y. 14650
3. Aldrich Chemical Co.
   940 West St. Paul Avenue
   Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 40% in water

10.2 **Storage Temperature:** 40° - 120°F

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Mixture

13.3 **Boiling Point at 1 atm:** Data not available

13.4 **Freezing Point:** 5°F = -15°C = 258°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.29 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

HTC

HEPTACHLOR

Common Synonyms
1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene
1,4,5,6,7,8,8a-Heptachloro-2,3-cyclopentadiene
E3314

Solid White to light tan Camphor-like odor

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear goggles and self-contained eyepiece breathing apparatus.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not Flammable
Irritating gases may be produced when heated

Exposure

DUST
POISONOUS IF INHALED
If inhaled will cause headache or loss of consciousness.
If in eyes, wash with plenty of water.
If breathing has stopped give artificial respiration.
If breathing is difficult give oxygen.

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.
In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes.
Remove contaminated clothing and shoes.
Wash affected areas with plenty of soap and water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is fully conscious, give a cupful of water. DO NOT induce vomiting.
IF SWALLOWED and victim is not fully conscious, or having convulsions, do not give anything by mouth. Keep warm and quiet. Get medical attention immediately.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Isolate warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,4,5,6,7,8,8-Heptachlorodicyclopentadiene; 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene; Velsicol
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $C_{10}H_5Cl_7$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White, light tan
4.3 **Odor:** Camphor-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective respirator, rubber gloves, clean clothes
5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation, tremors, and collapse. Ingestion causes nausea, vomiting, diarrhea, and irritation of the gastrointestinal tract. Contact with dust causes irritation of eyes and moderate irritation of skin.
5.3 **Treatment for Exposure:** *Get medical attention following all severe exposures to heptachlor.* INHALATION: move to fresh air; if exposure to dust was severe, get medical attention. INGESTION: lavage stomach with warm tap water (unless convulsions are imminent); fats and oils should be avoided, as they increase the rate of absorption of all chlorinated hydrocarbons. EYES: wash repeatedly with water. SKIN: flush with water, then wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³
5.5 **Short-Term Inhalation Limits:** 2 mg/m³ for 30 min
5.6 **Toxicity by Ingestion:** Grade 4; oral LD_{50} = 40 mg/kg (rat)
5.7 **Late Toxicity:** Liver damage may develop
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** 0.02 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.1 ppm/24 hr trout; 80+ bull fresh water
0.230 ppm/96 hr goldfish; 11 m fresh water
0.25 ppm/48 hr/white shrimp; 11 m/salt water
8.2 **Waterfowl Toxicity:** 2000 mg/kg
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Bioconcentration of up to 17,600 in oysters and 8,200 in bluegills. A spill could cause potential problem with shellfish.

9. SELECTED MANUFACTURERS

Velsicol Chemical Corp
341 E. Ohio St.
Chicago, Ill. 60611

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, 72+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 373.5
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 115 - 165°F = 46 - 74°C = 319 - 347°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.66 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(continued on page 5 and 6)

NOTES

HPT	# HEPTANE

Common Synonyms
n-Heptane

Watery liquid | Colorless | Gasoline-like odor

Floats on water. Flammable vapor is produced.

[illegible] discharge of runoff. Keep people away.
Shut off ignition sources and all fire [illegible]
Stay upwind and use water spray [illegible] vapor.
Isolate and remove discharged material.
[illegible]

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, carbon dioxide, water spray, foam.
[illegible]

Exposure

[illegible] MEDICAL AID

VAPOR
Not irritating to eyes, nose or throat.
If inhaled, will cause coughing or difficult breathing.
[illegible]
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with a gentle stream of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, 1978, [illegible]

Initial isolation: [illegible] flammability
Evacuation
Dispersal of [illegible]

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Heptane
3.2 **Coast Guard Compatibility Classification:** Paraffin
3.3 **Chemical Formula:** $CH_3(CH_2)_5CH_3$
3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** [illegible]
4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety glasses, [illegible]
5.2 **Symptoms Following Exposure:** INHALATION [illegible] irritation, coughing, depression, cardiac arrhythmias. ASPIRATION [illegible] pneumonia, pulmonary edema, mild cyanosis, depression. INGESTION [illegible] irritation, nausea, vomiting, abdominal pain, depression, headache.
5.3 **Treatment for Exposure:** INHALATION [illegible] oxygen. Artificial respiration if not breathing. ASPIRATION [illegible] administer oxygen. INGESTION [illegible] DO NOT induce vomiting. SKIN OR EYES [illegible] contaminated clothing and shoes. Wash skin and eyes with plenty of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm
5.5 **Short-Term Inhalation Limits:** [illegible] ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 0 [illegible]
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to the eyes and nose.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard if splashed in the eyes. May cause irritation that is more severe than vapor irritation. Prolonged or repeated skin contact may cause defatting and reddening of the skin.
5.10 **Odor Threshold:** 220 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] F (C)
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide, water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Class [illegible]
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** None needed
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 4924 ppm [illegible] hr [illegible] Fish
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** [illegible] lbs/lb
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]
Exxon
[illegible]
Phillips Petroleum Co.
[illegible]
Shell Oil Co.
Texaco, Inc.

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Various grades [illegible] Spec 99
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No [illegible]
10.4 **Venting:** Open [illegible] pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, [illegible]

A I I S W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
[illegible]	[illegible]
Health	
Vapor (inhaled)	
Liquid or Solid (Skin)	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetics	
Reactivity	
Other Reactivity	
Water	
Self Reaction	

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** [illegible]
13.6 **Critical Pressure:** [illegible]
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** 51 dynes/cm = 0.051 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** None
13.15 **Heat of Solution:** None
13.16 **Heat of Polymerization:** None

[illegible]

NOTES

REVISED 1978

HTN	HEPTANOL

Common Synonyms
Enanthic alcohol
Hydroxyheptane
1-Heptanol
Heptyl alcohol

Watery liquid | Colorless | Weak alcohol odor

Floats on water

[illegible] possible
[illegible] dispersion
[illegible] and remove the hazard material
[illegible] health and public [illegible]

Fire

Combustible

[illegible]

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Foaming in shoreline
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

[illegible]

2. LABELS

[illegible]

3. CHEMICAL DESIGNATIONS

3 1 Synonyms: [illegible]
3 2 Coast Guard Compatibility Classification: [illegible]
3 3 Chemical Formula: [illegible]
3 4 IMCO United Nations Numerical Designation: [illegible]

4. OBSERVABLE CHARACTERISTICS

4 1 Physical State (as shipped): [illegible]
4 2 Color: [illegible]
4 3 Odor: [illegible]

5 HEALTH HAZARDS

5 1 Personal Protective Equipment: [illegible]
5 2 Symptoms Following Exposure: [illegible]
5 3 Treatment for Exposure: [illegible]
5 4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5 5 Short-Term Inhalation Limits: [illegible]
5 6 Toxicity by Ingestion: Grade 2, oral rat LD_{50} = 1.8 g/kg
5 7 Late Toxicity: [illegible]
5 8 Vapor (Gas) Irritant Characteristics: [illegible]
5 9 Liquid or Solid Irritant Characteristics: [illegible]
5 10 Odor Threshold: 0.59 ppm

6 FIRE HAZARDS

6 1 Flash Point: 170°F C.C.
6 2 Flammable Limits in Air: [illegible]
6 3 Fire Extinguishing Agents: [illegible]
6 4 Fire Extinguishing Agents Not to be Used: [illegible]
6 5 Special Hazards of Combustion Products: [illegible]
6 6 Behavior in Fire: [illegible]
6 7 Ignition Temperature: [illegible]
6 8 Electrical Hazard: [illegible]
6 9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7 1 Reactivity with Water: [illegible]
7 2 Reactivity with Common Materials: [illegible]
7 3 Stability During Transport: [illegible]
7 4 Neutralizing Agents for Acids and Caustics: [illegible]
7 5 Polymerization: [illegible]
7 6 Inhibitor of Polymerization: [illegible]

8. WATER POLLUTION

8 1 Aquatic Toxicity: [illegible]
8 2 Waterfowl Toxicity: [illegible]
8 3 Biological Oxygen Demand (BOD): [illegible]
8 4 Food Chain Concentration Potential: [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10 1 Grades of Purity: [illegible]
10 [illegible] Storage Temperature: [illegible]
10 2 Inert Atmosphere: [illegible]
10 4 Venting: [illegible]

11 HAZARD ASSESSMENT CODE

[illegible]

NTE

12. HAZARD CLASSIFICATIONS

12 1 Code of Federal Regulations: Not listed
12 2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12 3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 Physical State at 15°C and 1 atm: [illegible]
13 2 Molecular Weight: [illegible]
13 3 Boiling Point at 1 atm: [illegible]
13 4 Freezing Point: [illegible]
13 5 Critical Temperature: [illegible]
13 6 Critical Pressure: [illegible]
13 7 Specific Gravity: [illegible]
13 8 Liquid Surface Tension: [illegible]
13 9 Liquid-Water Interfacial Tension: [illegible]
13 10 Vapor (Gas) Specific Gravity: [illegible]
13 11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13 12 Latent Heat of Vaporization: [illegible]
13 13 Heat of Combustion: [illegible]
13 14 Heat of Decomposition: [illegible]
13 15 Heat of Solution: [illegible]
13 16 Heat of Polymerization: [illegible]

[illegible]

NOTES

REVISED 1978

HTE

1-HEPTENE

Common Synonyms
Heptylene

Water's Iquid | Colorless | Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, CO2, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

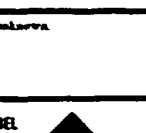
Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Heptylene

3.2 **Coast Guard Compatibility Classification:**
Olefin

3.3 **Chemical Formula:**
$CH_3(CH_2)_4CH{=}CH_2$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety goggles or face shield; similar to gasoline.
5.2 **Symptoms Following Exposure:** High concentrations may produce slight irritation of eyes and respiratory tract; may also act as simple asphyxiant and depress anesthesia.
5.3 **Treatment for Exposure:** Remove from exposure. Administer artificial respiration if needed.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available.
5.5 **Short-Term Inhalation Limits:** Data not available.
5.6 **Toxicity by Ingestion:** Data not available.
5.7 **Late Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available.

6. FIRE HAZARDS

6.1 **Flash Point:** 25°F C.C. (est.)
6.2 **Flammable Limits in Air:**
LEL = 0.9; UEL not listed
6.3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
6.5 **Special Hazards of Combustion Products:** Not pertinent.
6.6 **Behavior in Fire:** Not pertinent.
6.7 **Ignition Temperature:** 500°F
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** 6.4 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.
7.2 **Reactivity with Common Materials:** No reaction.
7.3 **Stability During Transport:** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD):** Data not available.
8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

1. American Petrofina Inc.
Cowden Oil and Chemical Co.
Big Spring, Texas 79720
2. Exxon Chemical Co.
Houston, Texas 77001
3. Phillips Petroleum Co.
Bartlesville, Okla. 74004

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

A 1 L V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	0
Water Pollution	
Human Toxicants	0
Aquatic Toxicants	
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 98.19
13.3 **Boiling Point at 1 atm:**
93.5°F = 34.2°C = 307.4°K
13.4 **Freezing Point:**
-215.2°F = -137.3°C = 135.8°K
13.5 **Critical Temperature:**
391.4°F = 199.1°C = 472.3°K
13.6 **Critical Pressure:**
470 psia = 32.0 atm = 32.4 MN/m²
13.7 **Specific Gravity:** 0.697 at 20°C/4°C (liquid)
13.8 **Liquid Surface Tension:**
20.6 dynes/cm = 0.0206 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:**
50.2 dynes/cm = 0.0502 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.4
13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.057
13.12 **Latent Heat of Vaporization:**
132 Btu/lb = 73.3 cal/g = 307 kJ/kg
13.13 **Heat of Combustion:** -19,300 Btu/lb = -10,700 cal/g = -44,800 kJ/kg
13.14 **Heat of Decomposition:** Not applicable
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

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HCC — HEXACHLOROCYCLOPENTADIENE

Common Synonyms
Perchlorocyclopentadiene

Liquid Greenish yellow Harsh, unpleasant odor

Sinks in water

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
Wear goggles self contained breathing apparatus and rubber protective clothing (including gloves)
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Poisonous gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing
If an eyes hold eyelids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID
Will burn skin and eyes.
If swallowed will cause nausea and vomiting.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison, water contaminant, air contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Perchlorocyclopentadiene
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** C_5Cl_6
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Yellow or greenish yellow
4 3 **Odor:** Harsh pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing, including rubber gloves and rubber shoes or boots, self contained breathing apparatus, face shield

5 2 **Symptoms Following Exposure:** Inhalation of mist is highly irritating to mucous membranes causing lachrymation, sneezing and salivation, pulmonary edema may occur Ingestion causes nausea, vomiting, diarrhea depression Contact with eyes causes severe irritation Liquid is extremely irritating to the skin causing blistering and burning

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air, give artificial respiration and/or oxygen as needed INGESTION give large amounts of water and induce vomiting, give saline laxative EYES flush with water for at least 15 min , if irritation remains, get medical attention SKIN wash with soap and water until no odor remains

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 1 ppm (proposed)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 0 505 mg/kg (mouse) 113 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** 0 15 0 33 ppm

6. FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** If water is used on adjacent fires, do not allow water to enter drums or storage tanks

6 5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride, chlorine and phosgene gases may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly to form hydrochloric acid The reaction is not hazardous

7 2 **Reactivity with Common Materials:** In presence of moisture will corrode iron and other metals Flammable and explosive hydrogen gas may collect in enclosed space

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Highly toxic

8 2 **Waterfowl Toxicity:** Highly toxic

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** Possible accumulation of breakdown products

9. SELECTED MANUFACTURERS

1 Hooker Chemical Corporation
Industrial Chemicals Division
Niagara Falls, N Y 14302

2 Velsicol Chemical Corporation
341 East Ohio Street
Chicago Ill 60611

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 97+%, Synthesis grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poison Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 272 7

13 3 **Boiling Point at 1 atm:** 462°F = 239°C = 512°K

13 4 **Freezing Point:** 50°F = 10°C = 283°K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 71 at 20°C (liquid)

13 8 **Liquid Surface Tension** 37 5 dynes/cm = 0 0375 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** Data not available

13 10 **Vapor (Gas) Specific Gravity:** 9 42

13 11 **Ratio of Specific Heats of Vapor (Gas)** Data not available

13 12 **Latent Heat of Vaporization.** (est.) 76 Btu/lb = 42 cal/g = 1 8 × 10⁵ J/kg

13 13 **Heat of Combustion.** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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HEXADECYL SULFATE, SODIUM SALT

Common Synonyms			
Sodium cetyl sulfate solution Cetyl sodium sulfate	Solid paste or liquid May float or sink in water	White	Mild odor

Stop discharge if possible. Keep people away.
Isolate and remove discharge if natural.
Notify local health and pollution control agencies.

Fire	Not Flammable
Exposure	CALL FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cetyl sodium sulfate
Sodium cetyl sulfate solution

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:**
$CH_3(CH_2)_{14}CH_2OSO_3Na \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)**
Pasty solid or liquid

4 2 **Color:** White

4 3 **Odor:** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Plastic or rubber gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Contact with eyes causes mild irritation. May cause skin to dry out and become irritated

5 3 **Treatment for Exposure:** If EYES or SKIN, flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.**

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 0.76 ppm/24 hr/orv/as 11

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

Alcolac Inc
3440 Fairfield Rd
Baltimore, Md. 21226

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

(Liquid) A P
(Solid) S S

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm**
Solid or liquid

13 2 **Molecular Weight:** Not pertinent (mixture)

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

HAC	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE

Common Synonyms
Cetyltrimethylammonium chloride solution

Liquid Clear to pale yellow. Rubbing alcohol odor

Floats or sinks in water

Stop discharge if possible. Keep people away.
Shut off ignition sources. Call fire department.
Avoid contact with liquid and vapor.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Irritating gases may be produced when heated.
Flashback vapor along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemicals, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant.
Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cetyltrimethylammonium chloride solution

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula** $C_{16}H_{33}(CH_3)_3NCl \cdot H_2O \cdot (CH_3)_2CHOH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Almost clear to pale yellow

4 3 **Odor:** Like rubbing alcohol

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves.

5 2 **Symptoms Following Exposure:** Ingestion may produce toxic effects. Contact with eyes or skin may cause severe damage.

5 3 **Treatment for Exposure:** INGESTION: do NOT induce vomiting; drink large quantities of fluid and call a physician immediately. EYES: flush with water for at least 15 min. and call a physician. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Grade 3. LD_{50} 250 mg/kg(rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 69°F C.C. (for isopropyl alcohol solutions only)

6 2 **Flammable Limits in Air:** 2% - 12% (isopropyl alcohol)

6 3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Irritating fumes of hydrogen chloride may form in fires.

6 6 **Behavior in Fire:** Solvent vapors are heavier than air and may travel to a source of ignition and flash back.

6 7 **Ignition Temperature:** 750°F (isopropyl alcohol)

6 8 **Electrical Hazard** (for isopropyl alcohol): Class 1, Group D

6 9 **Burning Rate:** (isopropyl alcohol solutions) 2.3 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Armak Chemicals Div
Box 1805
Chicago, Ill. 60690

2 Lonza, Inc.
Fair Lawn, N.J. 07410

3 Ashland Chemical Co.
P.O. Box 2219
Columbus, Ohio 43216

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 25% solution in water. 50% solution in a mixture of isopropyl alcohol and water, which is flammable. If the chemical (or a solution with concentration greater than 50%) is shipped, contact with skin and eyes should be avoided.

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 319 (solute only)

13 3 **Boiling Point at 1 atm:** (isopropyl alcohol) 180°F = 82.3°C = 355.5°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (approx.) 0.9 at 25°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 4 and 5)

NOTES

HAL	# n-HEXALDEHYDE

Common Synonyms
Caproaic aldehyde
Caproaldehyde
Hexanal
Capronaldehyde
n Caproylaldehyde

Liquid Colorless Sharp unpleasant odor

Floats on water
Flammable, irritating vapor is produced

Stop discharge if possible Keep people away
Shut off ignition sources Call fire department
Avoid contact with liquid and vapor
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Extinguish with dry chemicals foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

VAPOR
Irritating to eyes nose and throat
Harmful if inhaled

If in eyes hold eyelids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have vomiting induced
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

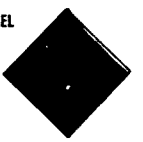
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Caproaldehyde Caproic aldehyde Caponaldehyde n Caproylaldehyde, Hexanal

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_6H_5(C_6H_5)CHO$

3 4 **IMCO/United Nations Numerical Designation:** 33/1207

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes irritation of mouth and stomach Contact with vapor or liquid irritates eyes Liquid irritates skin

5 3 **Treatment for Exposure:** INGESTION give large amount of water and induce vomiting EYES flush with water for at least 15 min SKIN wipe off wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 4,890 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 90°F O C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 5 21 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee, Wis 53233

2 Pfaltz & Bauer, Inc
375 Fairfield Ave
Stamford, Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99+%, Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 100

13 3 **Boiling Point at 1 atm:** 262°F = 128°C = 401°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 83 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** 3 5

13 11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1 061 at 20°

13 12 **Latent Heat of Vaporization:** (est.) 153 Btu/lb = 85 cal/g = 3.6×10^5 J/kg

13 13 **Heat of Combustion:** (est.) −17,000 Btu/lb = −9 430 cal/g = -394×10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 6)

NOTES

HMD — HEXAMETHYLENEDIAMINE

Common Synonyms
1,6-Hexanediamine
1,6-Diaminohexane

Solid or watery liquid | Colorless | Weak ammonia odor

Floats and mixes with water

Avoid contact with liquid. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible

Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with water, foam, dry chemical, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

LIQUID OR SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Will burn eyes.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive, water contaminant.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
1,6-Diaminohexane
1,6-Hexanediamine
HMDA

3.2 **Coast Guard Compatibility Classification:** Amine

3.3 **Chemical Formula:** $NH_2(CH_2)_6NH_2$

3.4 **IMCO/United Nations Numerical Designation:** 8.0/1783

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid (anhydrous) or liquid (70% solution)

4.2 **Color:** Glassy solid, clear liquid

4.3 **Odor:** Weak, fishy

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing, eye protection

5.2 **Symptoms Following Exposure:** Vapors cause irritation of eyes and respiratory tract. Liquid irritates eyes and skin; may cause dermatitis.

5.3 **Treatment for Exposure:** SKIN OR EYES: flush immediately with water for 15 min; call a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Repeated exposure can cause anemia and damage kidneys and liver.

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** 0.0041 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point:** 160°F C.C.

6.2 **Flammable Limits in Air:**
0.7% - 6.3%

6.3 **Fire Extinguishing Agents:**
Data not available

6.4 **Fire Extinguishing Agents Not to be Used:**
Data not available

6.5 **Special Hazards of Combustion Products:**
Data not available

6.6 **Behavior in Fire:** Data not available

6.7 **Ignition Temperature:**
Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available

8.2 **Waterfowl Toxicity:**
Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Division
245 Park Ave.
New York, N.Y. 10017

2. E. I. duPont de Nemours & Co., Inc.
Plastics Department
Wilmington, Del. 19898

3. Monsanto Co.
Monsanto Textiles Co.
800 N. Lindbergh Blvd.
St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10.1 **Grades of Purity:**
Anhydrous 99.8%, 70% solution

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Nitrogen

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
Solid (anhydrous)
Liquid (70% solution)

13.2 **Molecular Weight.** 116.21

13.3 **Boiling Point at 1 atm:**
478°K = 205°C = 401°F

13.4 **Freezing Point:**
(anhyd.) 104.9°F = 40.5°C = 313.7°K
(70% soln.) 28°F = −2°C = 269°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:**
(anhyd.) 0.799 at 60°C (liquid)
(70% soln.) 0.933 at 20°C (liquid)

13.8 **Liquid Surface Tension** (anhyd.)
34.6 dynes/cm = 0.0346 N/m at 60°C

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization:**
203 Btu/lb = 113 cal/g = 4.73 × 10⁵ J/kg

13.13 **Heat of Combustion** (est.) = −12,200 Btu/lb = −6,790 cal/g = −284 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution** (est.) = −9 Btu/lb = −5 cal/g = −0.2 × 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

HMI — HEXAMETHYLENEIMINE

Common Synonyms
Hexahydroazepine
Azacycloheptane

Liquid Colorless to light yellow Ammonia-like odor

Floats and mixes slowly with water
Irritating vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
Shut off ignition sources Call fire department
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus
Extinguish with dry chemical, alcohol foam, carbon dioxide
Water may be ineffective in fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing, difficult breathing or loss of consciousness
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If swallowed, induce vomiting

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
If swallowed will cause nausea
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
IF SWALLOWED and victim is UNCONSCIOUS, OR HAVING CONVULSIONS
do nothing except keep victim warm
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive, air contaminant, water contaminant
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Azacycloheptane
Hexahydroazepine, Homopiperidine

3 2 **Coast Guard Compatibility Classification:** Aliphatic amine

3 3 **Chemical Formula:**
$CH_2CH_2CH_2CH_2CH_2NH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to light yellow

4 3 **Odor:** Ammonia like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, impervious gloves, chemical safety goggles, impervious apron and boots

5 2 **Symptoms Following Exposure:** Inhalation of vapor irritates respiratory tract; high concentrations may cause disturbance of the central nervous system. Ingestion causes burns of mouth and stomach. Contact with concentrated vapor may cause severe eye injury. Contact with liquid causes burns of eyes and skin.

5 3 **Treatment for Exposure:** INHALATION: remove victim to uncontaminated atmosphere, get medical attention. INGESTION: give large amount of water, do NOT induce vomiting, get medical attention if large amount was swallowed. EYES: flush with water for 15 min. and get medical attention. SKIN: flush with water, wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 32 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 99°F O.C.

6 2 **Flammable Limits in Air:** 1.6% - 2.3%

6 3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Celanese Chemical Company
245 Park Avenue
New York, N.Y. 10017

2 Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

3 Pfaltz and Bauer, Inc.
375 Fairfield Ave.
Stamford, Conn. 06902

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial, Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 99

13 3 **Boiling Point at 1 atm.** 270°F = 132°C = 405°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.880 at 20°C (liquid)

13 8 **Liquid Surface Tension.** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

HMT — HEXAMETHYLENETETRAMINE

Common Synonyms
HEXA
Urotropin
Hexamine
Methenamine
Ammonoformaldehyde

Solid crystals or powder — White — Mild ammonia odor

Sinks and mixes with water

Avoid contact with solid
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with water foam dry chemical or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Aminoform
Ammonium
Hexamine
Methenamine
Urotropin
3 2 **Coast Guard Compatibility Classification** Aldehyde or amine
3 3 **Chemical Formula:** $C_6H_{12}N_4$
3 4 **IMCO United Nations Numerical Designation.** 4 1 1 3 2 5

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** White
4 3 **Odor:** Mild ammonia like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gloves for dusty or unventilated conditions use dust filter respirator and goggles
5 2 **Symptoms Following Exposure** Prolonged and repeated contact may cause skin irritation
5 3 **Treatment for Exposure** Wash skin or eyes thoroughly with water Call a physician
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion** Grade 2 LD$_{50}$ 0.5 to 5 g/kg (human)
5 7 **Late Toxicity** None
5 8 **Vapor (Gas) Irritant Characteristics** Vapors are not irritating to the eyes and throat
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 482°F C C
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water foam carbon dioxide dry chemical
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products.** Formaldehyde gas and ammonia may be given off when hot
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature** >700°F
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Borden Inc
Borden Chemical Division
50 W Broad St
Columbus Ohio 43215

2 Hooker Chemical Corp
Walck Rd
N Tonawanda N Y 14120

3 Wright Chemical Corp
Riegelwood N C 28456

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical USP
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 140.19
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity** 1.33 at 20 C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** −13 400 Btu/lb = −7440 cal/g = −310 × 10^5 J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and A

NOTES

HXA	# HEXANE

Common Synonyms
n-Hexane

Watery liquid Colorless Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to nose and throat.
If inhaled, will cause coughing or dizziness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Evacuate area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Paraffin
3 3 **Chemical Formula:** C_6H_{14} or $CH_3(CH_2)_4CH_3$
3 4 **IMCO/United Nations Numerical Designation:** 3 / 1208

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Eye protection (like gasoline)
5 2 **Symptoms Following Exposure:** INHALATION causes irritation of respiratory tract, cough, mild depression, cardiac arrhythmias. ASPIRATION causes severe lung irritation, coughing, pulmonary edema, extremities followed by depression. INGESTION causes nausea, vomiting, swelling of abdomen, headache, depression.
5 3 **Treatment for Exposure:** Call a doctor. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, give oxygen if needed. INGESTION: do NOT induce vomiting. SKIN OR EYES: wipe off, wash skin with soap and water, wash eyes with copious amounts of water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm
5 5 **Short-Term Inhalation Limits:** 500 ppm for 30 min
5 6 **Toxicity by Ingestion:** Very slight
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to the eyes and throat.
5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** −7°F (C.C.)
6 2 **Flammable Limits in Air:** 1.2% - 7.7%
6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Vapors may explode
6 7 **Ignition Temperature:** 437°F
6 8 **Electrical Hazard:** Class I, group D
6 9 **Burning Rate:** 7.4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** 0% (theor.) 7 days
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Humphrey Chemical Co.
Devine St.
North Haven, Conn. 06473
2 Phillips Petroleum Co.
Bartlesville, Okla. 74004
3 Shell Oil Co.
Kansas City, Mo. 64141

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Research grade, technical grade
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X T U V W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicants	1
Aquatic Toxicants	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 86.17
13 3 **Boiling Point at 1 atm:** 155.7°F = 68.7°C = 341.9°K
13 4 **Freezing Point:** −219.3°F = −139.6°C = 133.6°K
13 5 **Critical Temperature:** 453.6°F = 234.2°C = 507.4°K
13 6 **Critical Pressure:** 436.6 psia = 29.7 atm = 3.01 MN/m²
13 7 **Specific Gravity:** 0.659 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 18.4 dynes/cm = 0.0184 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** 51.1 dynes/cm = 0.0511 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** 3.0
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.063
13 12 **Latent Heat of Vaporization:** 144 Btu/lb = 80.0 cal/g = 3.35 × 10⁵ J/kg
13 13 **Heat of Combustion:** −19,248 Btu/lb = −10,692 cal/g = −447.65 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6.

NOTES

REVISED 1978

HXN	# HEXANOL

Common Synonyms
1-Hexanol
n-Hexyl alcohol
n-Amylcarbinol

Clear liquid | Colorless | Sweet odor

Floats on water

No discharge is permitted. Keep people away.
Call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with dry chemical, alcohol foam, carbon dioxide.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn eyes.
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.
Notify local health and pollution control agencies.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Amyl carbinol
1-Hexanol
Hexyl alcohol
1-Hydroxyhexane

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $CH_3(CH_2)_5OH$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweet, mild

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical gloves, chemical goggles

5.2 **Symptoms Following Exposure:** Liquid causes eye burns and skin irritation. Breathing vapors is not expected to cause systemic illness.

5.3 **Treatment for Exposure:** In case of contact, immediately flush skin and eyes with plenty of water. Wash eyes at least 15 min and get medical care.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 [Dog 0.5 to 5 g/kg (oral)]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure; may cause second-degree burns on long exposure

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 149°F (OC), 145°F (CC)

6.2 **Flammable Limits in Air:** 1.2% - 7.7% (calc.)

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 560°F (est.)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 97% in 10 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Continental Oil Co.
Conoco Chemicals Division
Park 80 Plaza East
Saddle Brook, N.J. 07662

2 Ethyl Corp.
Industrial Chemicals Division
451 Florida St.
Baton Rouge, La. 70801

3 Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A-T-L

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid

12.2 **MAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 102.18

13.3 **Boiling Point at 1 atm:** 315.4°F = 157.4°C = 430.5°K

13.4 **Freezing Point:** -49.3°F = -44.6°C = 228.6°K

13.5 **Critical Temperature:** 610.6°F = 321°C = 610.2°K

13.6 **Critical Pressure:** 855 psia = 57 atm = 5.8 MN/m²

13.7 **Specific Gravity:** 0.8151 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24.9 dynes/cm = 0.0249 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 6.8 dynes/cm = 0.0068 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.057

13.12 **Latent Heat of Vaporization:** 259 Btu/lb = 143.9 cal/g = 6.024 × 10⁵ J/kg

13.13 **Heat of Combustion:** -19,410 Btu/lb = -10,783 cal/g = -451.0 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7-HXN)

NOTES

REVISED 1978

HXE — 1-HEXENE

Common Synonyms
alpha-Hexene
Hexylene

Watery liquid | Colorless | Mild pleasant odor

Floats on water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid and vapor.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
If inhaled, will cause dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have him drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

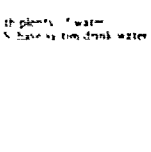
Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning: high flammability.
Evacuate area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** alpha Hexene
3.2 **Coast Guard Compatibility Classification:** Olefin
3.3 **Chemical Formula:** $CH_3(CH_2)_3CH{=}CH_2$
3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild pleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved organic vapor respirator or air line mask, protective goggles or face shield.
5.2 **Symptoms Following Exposure:** Inhalation may cause giddiness, incoordination, irritation that forms gaseous vapor. Prolonged exposure to high concentrations may induce loss of consciousness or death.
5.3 **Treatment for Exposure:** SKIN OR EYES: wash exposed surface area with soap and water; then flush eyes with water to remove any splashes. Launder contaminated clothing before reuse.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm suggested.
5.5 **Short-Term Inhalation Limits:** Data not available.
5.6 **Toxicity by Ingestion:** Data not available.
5.7 **Late Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics:** Slight smarting of the eyes or respiratory system if present in high concentrations. Effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Data not available.
5.10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point:** −15°F C.C.
6.2 **Flammable Limits in Air:** LEL (est.) = 2%; UEL not listed
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide.
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
6.5 **Special Hazards of Combustion Products:** Not pertinent.
6.6 **Behavior in Fire:** Not pertinent.
6.7 **Ignition Temperature:** 521°F
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** No information.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.
7.2 **Reactivity with Common Materials:** No reaction.
7.3 **Stability During Transport:** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD):** 1.4% 5 days.
8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

1. Gulf Oil Corp.
Petrochemicals Division
Cedar Bayou, Texas 77520
2. The Humphries Chemical Co.
Devine St.
North Haven, Conn. 06473
3. Phillips Petroleum Co.
Bartlesville, Okla. 74004

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 95-98%
Pure 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

A.T.L.V.W.

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Liquid
13.2 **Molecular Weight:** 84.16
13.3 **Boiling Point at 1 atm:** 146.3°F = 63.5°C = 336.7°K
13.4 **Freezing Point:** −218.0°F = −139.9°C = 133.4°K
13.5 **Critical Temperature:** 447.4°F = 230.8°C = 504.0°K
13.6 **Critical Pressure:** 469 psia = 31 atm = 3.2 MN/m²
13.7 **Specific Gravity:** 0.675 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 15.5 dynes/cm = 0.0155 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 31.6 dynes/cm = 0.0316 N/m at 22.7°C
13.10 **Vapor (Gas) Specific Gravity:** 2.9
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.06
13.12 **Latent Heat of Vaporization:** 140 Btu/lb = 78 cal/g = 3.3 × 10⁵ J/kg
13.13 **Heat of Combustion:** −19,134 Btu/lb = −10,630 cal/g = −445 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent.
13.15 **Heat of Solution:** Not pertinent.
13.16 **Heat of Polymerization:** Not pertinent.

(continued on next page)

NOTES

REVISED 1978

HXG HEXYLENE GLYCOL

Common Synonyms
2-Methyl-
2,4-pentanediol

Oily liquid | Colorless | Mild sweet odor

Floats and mixes slowly with water

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Corrosive
Restrict access
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None commonly used
3.2 **Coast Guard Compatibility Classification:** Glycol
3.3 **Chemical Formula:** $C_6H_{14}O_2$
3.4 **IMCO United Nations Numerical Designation:** NO 2080

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ammonia like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Ammonia type gas mask, self-contained breathing apparatus (pressure-demand), rubber gloves, clothes, and open-type safety shower must be available

5.2 **Symptoms Following Exposure:** Vapors cause itching, swelling, and blistering of eyelids, nose, and throat; symptoms may be delayed for several hours. Temporary blindness may occur. Liquid causes a caustic burn if not washed off at once. Ingestion or absorption through skin causes nausea, dizziness, headache. Severe exposure may cause death

5.3 **Treatment for Exposure:** Call a doctor at once. INHALATION: remove to fresh air; observe for development of delayed symptoms. Keep quiet. INGESTION: do NOT induce vomiting; give egg whites or other emollient. SKIN OR EYES: wash with large amounts of water for at least 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value):** ppm

5.5 **Short-Term Inhalation Limits:** ppm for minutes

5.6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ 500 to 5000 mg/kg (rats)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact. Very irritating to the eyes

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 200 F (93 C)
6.2 **Flammable Limits in Air:** 1.2% (Vol.)
6.3 **Fire Extinguishing Agents:** Water, alcohol foam, carbon dioxide, or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating fumes generated when heated
6.6 **Behavior in Fire:** May explode if heated
6.7 **Ignition Temperature:** May ignite spontaneously (glass)
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 1 mm/min (est.)

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Can catalyze when in contact with porous materials such as wood, asbestos, cloth, earth, and rusty metals
7.3 **Stability During Transport:** Stable at ordinary temperatures. When heated can decompose to nitrogen and ammonia gases, but decomposition is not hazardous unless material is confined
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water. Neutralize the resulting solution with calcium hypochlorite (HTH), with peroxide, or hydrazine
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 146 ppm/48 hr/rainbow trout/dist. fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 100%
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Fairmount Chemical Co., Inc.
117 Blanchard St.
Newark, N.J. 07105
2. Olin Corp.
Chemicals Division
120 Long Ridge Rd.
Stamford, Conn. 06904
3. Universal Oil
Universal Chemical Division
Spencer St.
Saugatuck, Conn. 06880

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous, 35–60% water solutions
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Padded
10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	2

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 118.18
13.3 **Boiling Point at 1 atm:** 396.9°F = 202.7°C = 475.9°K
13.4 **Freezing Point:** 34.7°F = 1.5°C = 274.7°K
13.5 **Critical Temperature:** 716°F = 380°C = 653°K
13.6 **Critical Pressure:** 2130 psia = 145 atm = 14.7 MN/m²
13.7 **Specific Gravity:** 0.908 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.05
13.12 **Latent Heat of Vaporization:** 135 Btu/lb = 299 cal/g = 12.5 × 10³ J/kg
13.13 **Heat of Combustion:** −8345 Btu/lb = −4636 cal/g = −194.1 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** −218 Btu/lb = −121 cal/g = −5.07 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(continued on page 5 and 6)

NOTES

REVISED 1978

HDZ HYDRAZINE

Common Synonyms

Watery liquid | Colorless | Ammonia odor

Mixes with water. Poisonous, flammable vapor is produced. Freezing point is 35° F.

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible. Call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear chemical protective suit with self-contained breathing apparatus.
Combat fires from safe distance or protected location.
Flood discharge area with water.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Cool exposed containers with water.
Continue cooling after fire has been extinguished.

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.
Irritating to eyes.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

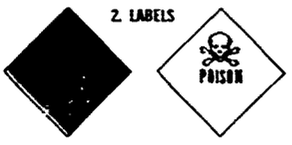
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, corrosive.
Restrict access.
Chemical and physical treatment.

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** N_2H_4
3.4 **IMCO United Nations Numerical Designation:** UN 2030

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ammonia-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Ammonia-type gas mask, self-contained breathing apparatus, plastic-coated or rubber gloves, clothes, and apron; safety shower must be available.
5.2 **Symptoms Following Exposure:** Vapors cause itching, swelling, and blistering of eyelids; nose and throat symptoms may be delayed for several hours. Temporary blindness may occur. Liquid causes a caustic-like burn if not washed off at once. Ingestion or absorption through skin causes nausea, dizziness, headache. Severe exposure may cause death.
5.3 **Treatment for Exposure:** Call a doctor at once. INHALATION: remove to fresh air; observe for development of delayed symptoms. Keep quiet. INGESTION: do NOT induce vomiting; give egg whites or other emollients. SKIN OR EYES: wash with large amounts of water for at least 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm
5.5 **Short-Term Inhalation Limits:** 1 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 3. LD_{50} to 500 mg/kg (rat)
5.7 **Late Toxicity:** Causes lung cancer in mice
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate to high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eyes.
5.10 **Odor Threshold:** 3 - 4 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 100°F (38°C)
6.2 **Flammable Limits in Air:** 4.7% - 100%
6.3 **Fire Extinguishing Agents:** Water, alcohol foam, carbon dioxide, or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic vapors generated when heated
6.6 **Behavior in Fire:** May explode; stressed
6.7 **Ignition Temperature:** May ignite spontaneously [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Can catalyze when in contact with porous materials such as wood, asbestos, cloth, earth, and rust; metal
7.3 **Stability During Transport:** Stable at ordinary temperatures. When heated can decompose to nitrogen and ammonia gases, but decomposition not hazardous unless materials are confined
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water. Neutralize the resulting solution with calcium hypochlorite (HTH): 1 lb per lb of hydrazine
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 1.6 ppm/96 hr (rainbow trout, dilute fresh water)
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 100%
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Fairmount Chemical Co., Inc.
117 Blanchard St.
Newark, N.J. 07105

2 Olin Corp.
Chemicals Division
120 Long Ridge Rd.
Stamford, Conn. 06904

3 Uniroyal Inc.
Uniroyal Chemical Division
Spencer St.
Naugatuck, Conn. 06770

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous, 85% and 64% water solutions
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Padded
10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A P-Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 32.07
13.3 **Boiling Point at 1 atm:** 236.1°F = 113.5°C = 386.7°K
13.4 **Freezing Point:** 34.7°F = 1.5°C = 274.7°K
13.5 **Critical Temperature:** 716°F = 380°C = 653°K
13.6 **Critical Pressure:** 2130 psia = 145 atm = 14.7 MN/m²
13.7 **Specific Gravity:** 1.008 at 68°F (20°C)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 288 Btu/lb = 160 cal/g = 669 J/g
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3

NOTES

REVISED 1978

HCL — HYDROCHLORIC ACID

Common Synonyms			
Muriatic Acid	Watery liquid	Colorless	Sharp, irritating odor

Sinks and mixes with water. Irritating vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Flammable gas may be produced on contact with metals.
Wear chemical protective suit with self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause coughing or difficult breathing.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with copious quantities of water.
IF SWALLOWED and victim is CONSCIOUS, have victim dilute acid by drinking water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Neutralize with lime, soda ash or caustic soda.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning - corrosive
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Muriatic acid
3.2 **Coast Guard Compatibility Classification:** Non-oxidizing mineral acid
3.3 **Chemical Formula:** HCl · H_2O
3.4 **IMCO United Nations Numerical Designation:** 1.0 1789

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to light yellow
4.3 **Odor:** Pungent, sharp, pungent irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing equipment; air line mask or industrial gas mask (type gas mask, rubber or rubber coated gloves, apron, coat, overalls, shoes).

5.2 **Symptoms Following Exposure:** Inhalation of fumes results in coughing and choking sensation and irritation of nose and lungs. Liquid causes burns.

5.3 **Treatment for Exposure:** INHALATION: remove person to fresh air; keep him warm and quiet and get medical attention immediately; start artificial respiration if breathing stops. INGESTION: have person drink water or milk; do NOT induce vomiting. EYES: immediately flush with plenty of water for at least 5 min. and get medical attention; continue flushing; flush another 5 min. if physician does not arrive promptly. SKIN: immediately flush with water; removing contaminated clothing; get medical attention promptly; use soap and wash area for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits:** 5 ppm for 5 min.

5.6 **Toxicity by Ingestion:** Data not available.

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Liquid is severe skin irritant; may cause pain and second degree burns after a few minutes' contact.

5.10 **Odor Threshold:** 1.1 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Non-flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Corrosive to most metals with evolution of hydrogen gas which may form explosive mixtures with air.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; apply powdered limestone, slaked lime, soda ash or sodium bicarbonate.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 282 ppm/96 hr mosquito fish; 11 mg/l fresh water; 100-330 ppm/48 hr shrimp; 10 mg/l salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Diamond Shamrock Corp.
Heavy Chemicals Division
1100 Union Commerce Bldg.
Cleveland, Ohio 44115

2. Stauffer Chemical Co.
Industrial Chemicals Division
380 Park Ave.
New York, N.Y. 10017

3. Vulcan Materials Co.
Chemicals Division
Wichita, Kan. 67201

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Food processing or technical; 18° Be', 27.9%; 20 Be', 31.5%; 22° Be', 34.2%; Reagent ACS and USP 23° Be', 35.1%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** 120.5 °F = 48.5 °C = 321.5 °K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.19 at 20 °C/4 °C
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 178 Btu/lb = 98.6 cal/g = 4.13 × 10^5 J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -840 Btu/lb = -480 cal/g = -20 × 10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

*Physical properties are for pure anhydrous material.

NOTES

REVISED 1978

HFA — HYDROFLUORIC ACID

Common Synonyms	Watery liquid	Colorless to green	Irritating odor
	Sinks and causes with water. Harmful vapor is produced.		

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Water spray may be used to flush spills away from exposures.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Flammable gas may be produced on contact with metals.
Wear chemical protective suit with self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Will burn eyes, nose and throat.
Harmful if inhaled.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
IF IN EYES, hold eyelids open and flush with plenty of water.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning: corrosive.
Restrict access.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms.
3.2 **Coast Guard Compatibility Classification:** Non-oxidizing mineral acid
3.3 **Chemical Formula:** HF H_2O
3.4 **IMCO United Nations Numerical Designation:** 8.0 1790

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to slightly yellow
4.3 **Odor:** Pungent, irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Proper protective clothing must be worn that encompasses the body, including the face. All persons handling this product must be familiar with and must observe all the precautions contained in the Manufacturing Chemists' Association Chemical Safety Data Sheet SD-25. A shower and an eye wash must be available.
5.2 **Symptoms Following Exposure:** Severe and painful burns of eyes and skin.
5.3 **Treatment for Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN: if victim has come in contact with liquid or vapor, put him in a shower and call a physician. EYES: flush with water for at least 15 min. and consult physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 3 ppm
5.5 **Short-Term Inhalation Limits:** 50 ppm for 60 min.
5.6 **Toxicity by Ingestion:** Data not available.
5.7 **Late Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe tissue irritant. Causes second- and third-degree burns on short contact; very dangerous to the eyes.
5.10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive
7.2 **Reactivity with Common Materials:** Will attack glass, concrete and certain metals containing silica, such as cast iron. Will attack natural rubber, leather and many organic materials. May generate flammable hydrogen in contact with some metals.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, apply protected limestone, slaked lime, soda ash or sodium bicarbonate.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 60 ppm* fish lethal, fresh water
*Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Allied Chemical Corp.
Industrial Chemicals Division
P.O. Box 1139R
Morristown, N.J. 07960

E.I. duPont de Nemours & Co. Inc.
Industrial & Biochemicals Dept.
DuPont Bldg.
Wilmington, Del. 19898

Kaiser Aluminum & Chemical Corp.
Kaiser Chemicals Division
P.O. Box 877
Gramercy, La. 70052

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Reagent 48-51% technical 52-55% 70% grade
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** None
13.3 **Boiling Point at 1 atm:** 67 F = 19 C = 292 K
13.4 **Freezing Point:** None
13.5 **Critical Temperature:** None
13.6 **Critical Pressure:** None
13.7 **Specific Gravity:** 1.15 at 20 C (liquid)
13.8 **Liquid Surface Tension:** None
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 649 Btu lb = 360 cal/g = 15.1 × 10^3 J/kg
13.13 **Heat of Combustion:** None
13.14 **Heat of Decomposition:** None
13.15 **Heat of Solution:** -66.6 Btu lb = 37.0 cal/g = -1.55 × 10^3 J kg
13.16 **Heat of Polymerization:** None

*Physical properties are for anhydrous HF

(continued on page 5)

NOTES

REVISED 1978

HBR — HYDROGEN BROMIDE

Common Synonyms
Hydrobromic Acid anhydrous

Liquefied compressed gas | Colorless | Irritating odor

Sinks and mixes with water | Poisonous visible vapor cloud is produced

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
Flammable gas may be produced on contact with metals
Use chemical protective clothing with self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
Will cause frostbite
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.
DO NOT RUB AFFECTED AREAS.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, corrosive air contaminant
Restrict access
Evacuate area
*Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Hydrobromic acid anhydrous, Hydrogen bromide anhydrous
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** HBr
3 4 **IMCO/United Nations Numerical Designation:** 2/1048

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Compressed liquefied gas
4 2 **Color:** Colorless
4 3 **Odor:** Sharp pungent irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Full face mask and acid gas canister, self contained breathing apparatus, chemical goggles, rubber apron and gloves, acid-proof clothing, safety shower
5 2 **Symptoms Following Exposure:** Inhalation causes severe irritation of nose and upper respiratory tract, lung injury. Ingestion causes burns of mouth and stomach. Contact with eyes causes severe irritation and burns. Contact with skin causes irritation and burns.
5 3 **Treatment for Exposure:** *Get medical attention after all overexposures to this chemical.* INHALATION: move victim to fresh air and keep him warm and quiet; if a qualified person is available to give oxygen, such treatment may be helpful. INGESTION: give large amounts of water or milk; do NOT induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water; treat acid burns.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 3 ppm
5 5 **Short-Term Inhalation Limits.** 5 ppm for 5 min
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Pressurized container may explode and release toxic, irritating vapor
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Moderate reaction with evolution of heat
7 2 **Reactivity with Common Materials:** Rapidly absorbs moisture forming hydrobromic acid. Highly corrosive to most metals with evolution of flammable hydrogen gas
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, apply powdered limestone, slaked lime, soda ash or sodium bicarbonate
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 10–100 ppm/96 hr */TL$_m$/*
*Species and water type not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corp.
Linde Division
270 Park Avenue
New York, N.Y. 10017

2 Matheson Gas Products
932 Paterson Plank Road
East Rutherford, N.J. 07073

3 Air Products and Chemicals, Inc.
Industrial Gas Division
Box 538
Allentown, Pa. 18105

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99.8+%
10 2 **Storage Temperature:** Ambient or lower
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C K-M N O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Nonflammable compressed gas
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas
13 2 **Molecular Weight:** 80.92
13 3 **Boiling Point at 1 atm.** −88.2°F = −66.8°C = 206.4°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature.** 193.6°F = 89.8°C = 363.0°K
13 6 **Critical Pressure:** 1,235 psia = 84 atm = 8.52 MN/m
13 7 **Specific Gravity:** 2.14 at −67°C (liquid)
13 8 **Liquid Surface Tension.** 27.1 dynes/cm = 0.0271 N/m at −67.1°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 2.71
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.38
13 12 **Latent Heat of Vaporization:** 92.3 Btu/lb = 51.3 cal/g = 2.15 × 10^5 J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** 445 Btu/lb = 247 cal/g = 10.3 × 10^5 J/kg
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

HDC — HYDROGEN CHLORIDE

Common Synonyms
Hydrochloric Acid, anhydrous

Liquefied compressed gas — Colorless to slightly yellow — Irritating odor

Sinks and mixes with water. Poisonous visible vapor cloud is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Flammable gas may be produced on contact with metals.
Wear chemical protective suit with self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes.
Will cause frostbite.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.
DO NOT RUB AFFECTED AREAS.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, corrosive, air contaminant.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Hydrochloric acid, anhydrous
3 2 **Coast Guard Compatibility Classification:** Inorganic acid
3 3 **Chemical Formula:** HCl
3 4 **IMCO/United Nations Numerical Designation:** 2.0/1050

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Compressed liquefied gas
4 2 **Color:** Colorless to slightly yellow
4 3 **Odor:** Sharp pungent irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Full face mask and acid gas canister, self contained breathing apparatus, chemical goggles, rubber apron and gloves, acid-proof clothing, safety shower.
5 2 **Symptoms Following Exposure:** Severely irritating to nose and upper respiratory tract, lung injury.
5 3 **Treatment for Exposure:** INHALATION: immediately remove patient to fresh air, keep him warm and quiet, and call a physician immediately; if a qualified person is available to give oxygen, such treatment may be helpful. INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES OR SKIN: immediately flush with plenty of water for at least 15 min; for eyes, get medical attention promptly; air contaminated clothing and wash before reuse.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5 5 **Short-Term Inhalation Limits:** 5 ppm for 5 min
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5 9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant; may cause pain and second degree burns after a few minutes' contact.
5 10 **Odor Threshold:** 1-5 ppm

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Pressurized container may explode and release toxic, irritating vapors.
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Moderate reaction with evolution of heat
7 2 **Reactivity with Common Materials:** Rapidly absorbs moisture forming hydrochloric acid. Highly corrosive to most metals with evolution of flammable hydrogen gas.
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate.
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 282 ppm/96 hr/mosquito fish/TL$_m$/fresh water
100-330 ppm/48 hr/shrimp/LC$_x$/salt water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Diamond Shamrock Corp.
Electro Chemicals Division
300 Union Commerce Bldg.
Cleveland, Ohio 44115

2 Stauffer Chemical Co.
Industrial Chemicals Division
299 Park Ave.
New York, N.Y. 10017

3 Vulcan Materials Co.
Chemical Division
Wichita, Kan. 67201

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 97.5-99%
10 2 **Storage Temperature:** Ambient or lower
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A C-x M N-O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Nonflammable compressed gas
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	2
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas
13 2 **Molecular Weight:** 36.46
13 3 **Boiling Point at 1 atm:** −121°F = −85.0°C = 188.2°K
13 4 **Freezing Point:** −175°F = −115°C = 158°K
13 5 **Critical Temperature:** 124.5°F = 51.4°C = 324.6°K
13 6 **Critical Pressure:** 1200 psia = 81.6 atm = 8.27 MN/m
13 7 **Specific Gravity:** 1.191 at −85°C (liquid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 1.3
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.398
13 12 **Latent Heat of Vaporization:** 185 Btu/lb = 103 cal/g = 4.31 × 10^5 J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** −884 Btu/lb = −491 cal/g = −20.6 × 10^5 J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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HCN — HYDROGEN CYANIDE

Common Synonyms
Hydrocyanic acid
Prussic acid

Watery liquid, or gas — Colorless — Bitter almond odor

Sinks and mixes with water. Poisonous, flammable vapor is produced and rises. Boiling point is 78° F

AVOID CONTACT WITH LIQUID AND VAPOR. EVACUATE AREA.
WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS.
Stop discharge if possible. Call fire department.
Shut off ignition sources.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS.
Stop discharge if possible.
Cool exposed containers and protect men effecting shutoff with water.
Let fire burn.

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes.
Move to fresh air.
If breathing has stopped, give artificial respiration (but NOT mouth to mouth).
If breathing is difficult, give oxygen.
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

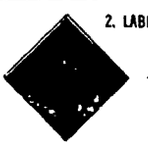
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, water contaminant
Restrict access.
Evacuate area.

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hydrocyanic acid, Prussic acid
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** HCN
3.4 **IMCO/United Nations Numerical Designation:** 2.0/1051

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to bluish white
4.3 **Odor:** Characteristic sweetish, like almond

5 HEALTH HAZARDS

CAUTION: Class A poison; a fatal dose can be caused by ingestion, inhalation, or absorption of liquid or vapor through skin, particularly eyes, mucous membranes, and feet.

5.1 **Personal Protective Equipment:** Escape purposes only: air escape mask with 5-minute air cylinder. Work purposes: vapor proof emergency suit or vinyl coated coverall, plus air mask with clear view facepiece, speaking diaphragm, demand regulator, and 30-minute air cylinder. Rubber gloves, chemical safety goggles, quick opening safety shower.

5.2 **Symptoms Following Exposure:** Irritation of throat, perspiration, difficult breathing, reddening of eyes, salivation, nausea, headache, weakness of arms and legs, giddiness, followed by collapse and convulsions.

5.3 **Treatment for Exposure:** Call a doctor. If breathing has stopped, give artificial respiration until doctor arrives. INHALATION: remove patient to fresh air. SKIN CONTACT: remove contaminated clothing and wash skin thoroughly with copious quantities of water and soap. EYE CONTACT: hold eyelids apart and wash eye with continuous gentle stream of water for at least 15 min.
If patient is unconscious, administer amyl nitrite by crushing a pearl (ampule) in a cloth and holding this under patient's nose for 15 seconds in every minute. Do not interrupt artificial respiration. Replace amyl nitrite pearl when its strength is spent. Continue treatment until patient's condition improves or doctor arrives.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm
5.5 **Short-Term Inhalation Limits:** 20 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 4; Probably less than 50 mg/kg

(Continued on page 4)

6 FIRE HAZARDS

6.1 **Flash Point.** 0 F C.C.
6.2 **Flammable Limits in Air:** 5.6% - 40.0%
6.3 **Fire Extinguishing Agents:** Stop flow of gas.
6.4 **Fire Extinguishing Agents Not to be Used:** None.
6.5 **Special Hazards of Combustion Products:** Extremely toxic vapors are generated even at ordinary temperatures.
6.6 **Behavior in Fire.** Containers may explode with ignition of contents.
6.7 **Ignition Temperature:** 1000°F
6.8 **Electrical Hazard:** Data not available.
6.9 **Burning Rate:** 1.5 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves with a moderate reaction.
7.2 **Reactivity with Common Materials:** None.
7.3 **Stability During Transport.** May become unstable and subject to explosion if stored for extended time or exposed to high temp. and pressure.
7.4 **Neutralizing Agents for Acids and Caustics:** The weak acidity can be neutralized by slaked lime, but this does not destroy the poisonous property.
7.5 **Polymerization.** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.16 ppm/72 hr/young bass/TLm/fresh water
0.069 ppm/24 hr/pin perch/TLm/salt water
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD):** Data not available.
8.4 **Food Chain Concentration Potential.** None.

9. SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Inc.
Electrochemicals Dept.
Wilmington, Del. 19898
2. Monsanto Polymers & Petrochemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166
3. Rohm and Haas Co.
Independence Mall West
Philadelphia, Pa. 19105

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 96% sometimes shipped as a water solution or absorbed on an inert solid. All forms are extremely toxic.
10.2 **Storage Temperature:** Data not available.
10.3 **Inert Atmosphere:** May be padded.
10.4 **Venting:** Data not available.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

ABCKIMN

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Poisonous gas or liquid, Class A
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	4
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.**
Liquid
13.2 **Molecular Weight:** 27.03
13.3 **Boiling Point at 1 atm:**
78.3°F = 25.7°C = 298.9°K
13.4 **Freezing Point:** 9.1°F = −13.3°C = 259.9°K
13.5 **Critical Temperature.**
362.3°F = 183.5°C = 456.7°K
13.6 **Critical Pressure:**
735 psia = 50 atm = 5.07 MN/m²
13.7 **Specific Gravity:** 0.689 at 20°C (liquid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 0.9
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.303
13.12 **Latent Heat of Vaporization**
444 Btu/lb = 247 cal/g = 10.3 × 10³ J/kg
13.13 **Heat of Combustion:** −10,360 Btu/lb = −5864 cal/g = −245.3 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

5. HEALTH HAZARDS (Cont'd)

5.7 **Late Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is not very irritating but is extremely poisonous.
5.9 **Liquid or Solid Irritant Characteristics:** Liquid is not irritating but is extremely poisonous if absorbed through skin or eyes.
5.10 **Odor Threshold:** 1 mg/m³

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HFX — HYDROGEN FLUORIDE

Common Synonyms
Hydrofluoric acid anhydrous

Liquid | Colorless | Sharp irritating odor

Sinks and mixes with water. Poisonous vapor is produced and slowly rises. Boiling point is 67° F

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit including self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Flammable gas may be produced on contact with metals.
Wear chemical protective suit including self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, corrosive.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hydrofluoric acid, anhydrous
3.2 **Coast Guard Compatibility Classification:** Inorganic acid
3.3 **Chemical Formula:** HF
3.4 **IMCO/United Nations Numerical Designation:** 2.0/1052

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pungent, irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid resistant hat, safety goggles, face shield, jacket, overalls, gauntlet type gloves, and boots. The goggles and face shield must have plastic lenses. There must be a shower and an eye wash. Observe all precautions contained in the Manufacturing Chemists' Association Chemical Safety Data Sheet SD-25.

5.2 **Symptoms Following Exposure:** Serious and painful burns of eyes, skin and respiratory tract, pulmonary edema.

5.3 **Treatment for Exposure:** INGESTION: have victim drink water or milk, do NOT induce vomiting. SKIN: flush with water, consult physician. EYES: flush with water for at least 15 min., consult physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 3 ppm

5.5 **Short-Term Inhalation Limits.** 4 ppm for 15 min.

5.6 **Toxicity by Ingestion:** Oral LDL_0 = 80 mg/kg (guinea pig)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eyes.

5.10 **Odor Threshold:** 0.03 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves with liberation of heat
7.2 **Reactivity with Common Materials:** Will attack glass, concrete and certain metals, especially those containing silica, such as cast iron. Will attack natural rubber, leather, and many organic materials. May generate flammable hydrogen gas in contact with some metals.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water, apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 60 ppm * fish lethal fresh water
*Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Industrial Chemicals Division
Morristown, N. J. 07960
2. E. I. duPont de Nemours & Co. Inc.
Industrial & Biochemicals Dept.
Wilmington, Del. 19898
3. Kaiser Aluminum & Chemical Corp.
Kaiser Chemicals Division
Gramercy, La. 70052

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.99.9%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C K M N O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	2
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight.** 20.01
13.3 **Boiling Point at 1 atm.** 67.1°F = 19.5°C = 292.7°K
13.4 **Freezing Point:** −134°F = −92.2°C = 181.0°K
13.5 **Critical Temperature:** 447°F = 230.6°C = 503.8°K
13.6 **Critical Pressure:** 1400 psia = 94 atm = 9.5 MN/m²
13.7 **Specific Gravity:** 0.992 at 19°C (liquid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 0.7
13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.369
13.12 **Latent Heat of Vaporization:** 145 Btu/lb = 80.5 cal/g = 3.37 × 10⁵ J/kg
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution** −1322 Btu/lb = −734.6 cal/g = −30.76 × 10⁵ J/kg
13.16 **Heat of Polymerization.** Not pertinent

Continued on next card.

NOTES

REVISED 1978

HXX HYDROGEN, LIQUEFIED

Common Synonyms

Liquid hydrogen

Liquefied compressed gas Colorless Odorless

Floats and boils on water Flammable visible vapor cloud is produced

Shut off ignition sources Call fire department
Avoid contact with liquid Keep people away
Stop discharge if possible
Stay upwind Use water spray to knock down vapor

Fire

FLAMMABLE
Flame is almost invisible
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Evacuate surrounding area
Stop flow of gas if possible
Cool exposed containers and protect men effecting shutoff with water

Exposure

VAPOR
If inhaled in high concentrations will cause difficult breathing or loss of consciousness
Move victim to fresh air
If breathing has stopped give artificial respiration

LIQUID
Will cause frostbite
Flush affected areas with plenty of water
DO NOT RUB AFFECTED AREAS

Water Pollution

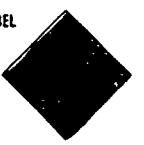
Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Liquid hydrogen
para Hydrogen

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** H

3 4 **IMCO/United Nations Numerical Designation** 2 1966

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety goggles or face shield insulated gloves and long sleeves cuffless trousers worn outside boots or over high top shoes to shed spilled liquid self-contained breathing apparatus containing air (never use oxygen)

5 2 **Symptoms Following Exposure:** If atmosphere does not contain enough oxygen inhalation can cause dizziness unconsciousness or even death Contact of liquid with eyes or skin causes freezing similar to a burn

5 3 **Treatment for Exposure.** The only effect of exposure to liquid hydrogen is that caused by its unusually low temperature and its action as a simple asphyxiant INHALATION if victim is unconscious (due to oxygen deficiency) move him to fresh air and apply resuscitation methods call physician EYES treat for frostbite SKIN treat for frostbite, soak in lukewarm water get medical attention if burn is severe

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Gas is non poisonous but can act as a simple asphyxiant

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion.** Not pertinent (gas with low boiling point)

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent

6 2 **Flammable Limits in Air:** 4.0% - 7.0%

6 3 **Fire Extinguishing Agents:** Let fire burn shut off gas supply

6 4 **Fire Extinguishing Agents Not to be Used:** Carbon dioxide

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Burns with an almost invisible flame

6 7 **Ignition Temperature.** 1,065°F

6 8 **Electrical Hazard:** Class I Group B

6 9 **Burning Rate:** 9.9 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Ambient temperature of water will cause vigorous vaporization of hydrogen

7 2 **Reactivity with Common Materials:** No chemical reaction, but low temperature causes most materials to become very brittle

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corporation
Linde Division
Morristown N J 03857

2 Air Products and Chemicals Inc
Specialty Gases Division
P O Box 538
Allentown Pa 18105

3 Chemetron Corp
Industrial Gases Division
111 E Wacker Drive
Chicago Ill 60601

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** −434°F

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C D E F G

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 2.0

13 3 **Boiling Point at 1 atm:** −422°F = −253°C = 20°K

13 4 **Freezing Point:** −435°F = −259°C = 14°K

13 5 **Critical Temperature:** −400°F = −240°C = 33°K

13 6 **Critical Pressure:** 188 psia = 12.8 atm = 1.30 MN/m

13 7 **Specific Gravity:** 0.071 at −253°C (liquid)

13 8 **Liquid Surface Tension** 2.3 dynes/cm = 0.023 N/m at −255°C

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 0.067

13 11 **Ratio of Specific Heats of Vapor (Gas).** 1.3962

13 12 **Latent Heat of Vaporization:** 190.5 Btu/lb = 105.8 cal/g = 4.427 × 10⁵ J/kg

13 13 **Heat of Combustion:** −9,080 Btu/lb = −2,523 cal/g = −1164.1 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

HPO HYDROGEN PEROXIDE

Common Synonyms
Peroxide
Albone
Superoxol

Watery liquid | Colorless | Slightly sharp odor

Sinks and mixes with water | Irritating vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit including self-contained breathing apparatus.
Stop discharge if possible. Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
May cause fire and explode on contact with combustibles and metals.
Containers may explode when heated.
Wear chemical protective suit including self-contained breathing apparatus.
Flood discharge area with water.

Exposure

CALL FOR MEDICAL AID.
VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Toxic warning: corrosive.
Restrict access.
Disperse and flush.

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Peroxide, Albone, Superoxol
3 2 **Coast Guard Compatibility Classification.** Not applicable
3 3 **Chemical Formula:** H_2O_2
3 4 **IMCO United Nations Numerical Designation:** 8 1 2015

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Slightly sharp

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective garments: both outer and inner made of a woven polyester fabric or of modacrylic or polyvinylidene fabrics impermeable apron made of polyvinyl chloride or polyethylene film; neoprene gloves and boots; goggles.
5 2 **Symptoms Following Exposure:** Although solutions and vapors are nontoxic, they are irritating. Vapor causes discomfort of eyes and nose. Moderately concentrated liquid can cause whitening of the skin and severe stinging sensation. In most cases the stinging subsides quickly and the skin gradually returns to normal without any damage. Highly concentrated liquid can cause blistering of skin if left on for any length of time; can also cause eye damage.
5 3 **Treatment for Exposure:** Contact should be avoided, but immediate flushing with water will prevent any reaction in case of accidental contact.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm
5 5 **Short-Term Inhalation Limits:** Data not available.
5 6 **Toxicity by Ingestion:** Data not available.
5 7 **Late Toxicity:** None.
5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5 9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes' contact.
5 10 **Odor Threshold:** Not pertinent.

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable but may cause fire and react violently on contact with combustibles and metals.
6 2 **Flammable Limits in Air:** Not flammable.
6 3 **Fire Extinguishing Agents:** Water for fires resulting from spillage.
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
6 5 **Special Hazards of Combustion Products:** Not pertinent.
6 6 **Behavior in Fire:** May explode in fire.
6 7 **Ignition Temperature:** Not flammable.
6 8 **Electrical Hazard:** Not pertinent.
6 9 **Burning Rate:** Not flammable.

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction.
7 2 **Reactivity with Common Materials:** Dirt and many metals cause a rapid decomposition with liberation of oxygen gas; occurs particularly if concentration is above 40%.
7 3 **Stability During Transport:** Pure grades are quite stable, but contamination with metals or dirt can cause rapid or violent decomposition.
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent.
7 5 **Polymerization:** Not pertinent.
7 6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

9 1 **Aquatic Toxicity:** > 40 ppm *(fingerling trout, fresh water; fingerling trout, salt water)
* Time period not specified
9 2 **Waterfowl Toxicity:** Data not available.
8 3 **Biological Oxygen Demand (BOD):** None.
8 4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

1 E I du Pont de Nemours & Co Inc
Electrochemicals Dept
Wilmington, Del 19898
2 FMC Corp
Inorganic Chemicals Division
633 Third Ave
New York, N Y 10017
3 Shell Chemical Co
Industrial Chemicals Division
Houston, Texas 77001

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Common commercial strengths are 27.5%, 35%, 50%, 70%, 90% and 98%. High Strength means greater than 52% Purity. Technical, Mil Spec, ACS. The hazard increases with the strength.
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Safety relief or pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V P 4

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizer
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemical	4
Water	1
Self Reaction	3

12 3 **NFPA Hazard Classifications**

Category	Classification	
% by wt =	27.5%	35%
Health Hazard (Blue)	2	2
Flammability (Red)	0	0
Reactivity (Yellow)	1	3
	ox	ox

13 PHYSICAL AND CHEMICAL PROPERTIES*

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 34.01
13 3 **Boiling Point at 1 atm:** 257°F = 125°C = 398°K
13 4 **Freezing Point:** −40.5°F = −40.3°C = 232.9°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.29 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.241
13 12 **Latent Heat of Vaporization**
482 Btu/lb = 301 cal/g
= 12.6 × 10⁵ J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** −1220 Btu/lb
= −678 cal/g = −28.3 × 10⁵ J/kg
13 15 **Heat of Solution:** −20.2 Btu/lb
= −11.2 cal/g = −0.469 × 10⁵ J/kg
13 16 **Heat of Polymerization:** Not pertinent

*Physical properties apply to 70% solution

(Continued on page 5 and 6)

NOTES

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HDS HYDROGEN SULFIDE

Common Synonyms:
Sulphuretted hydrogen

Liquefied compressed gas Colorless Rotten egg odor, but odorless at poisonous concentrations

Sinks and boils in water. Poisonous, flammable, visible vapor cloud is produced

[illegible] with gas. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off gas. Let vapor burn.
Stop flow of gas.
[illegible]
[illegible]
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
May explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Stop flow of gas if possible.
[illegible]
[illegible]

Exposure

ALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
IN EYES: Hold eyelids apart and flush with plenty of water.

Water Pollution

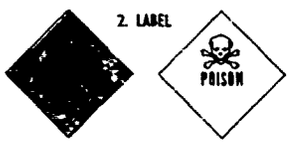
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]
[illegible]

1. GESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, poison
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Sulfuretted hydrogen
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** H_2S
3.4 **IMCO/United Nations Numerical Designation:** 2.0 1053

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid under pressure
4.2 **Color:** Colorless
4.3 **Odor:** Offensive odor like rotten eggs

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber framed goggles, approved respirators, protective
5.2 **Symptoms Following Exposure:** Irritation of eyes, nose and throat. If high concentrations are inhaled, hyperpnea and respiratory paralysis may occur. Very high concentrations may produce pulmonary edema.
5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, if breathing has stopped, give artificial respiration, administer oxygen if needed, consult physician. EYES: wash with plenty of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm
5.5 **Short-Term Inhalation Limits:** 200 ppm for 10 min., 100 ppm for 30 min., and 50 ppm for 60 min.
5.6 **Toxicity by Ingestion:** Hydrogen sulfide is present as a gas at room temperature, so ingestion not likely
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.0047 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Flammable gas
6.2 **Flammable Limits in Air:** 4.3% - 45%
6.3 **Fire Extinguishing Agents:** Stop flow of gas
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic gases are generated in fires
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 500°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 2.3 mm/min (Liquid)

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 1.38 ppm/48 hr fathead minnows, TL_m fresh water; sat. 0.5 hr bullfrog lethal salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. PPG Industries Inc
Industrial Chemicals Division
One Gateway Center
Pittsburgh, Pa. 90670
2. Union Oil Co. of California
Union Oil Center
Los Angeles, Cal. 90017
3. Will Ross, Inc.
Matheson Gas Products Division
East Rutherford, N.J. 07073

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Purified technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A B C D E F G

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Gas
13.2 **Molecular Weight:** 34.08
13.3 **Boiling Point at 1 atm:** −76.5°F = −60.4°C = 212.7°K
13.4 **Freezing Point:** −117°F = −82.8°C = 190.4°K
13.5 **Critical Temperature:** 212.7°F = 100.4°C = 373.6°K
13.6 **Critical Pressure:** 1300 psia = 88.9 atm = 9.01 MN/m²
13.7 **Specific Gravity:** 0.916 at −60°C (Liquid)
13.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.03 N/m at −81.1°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 1.2
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.322
13.12 **Latent Heat of Vaporization:** 234 Btu/lb = 130 cal/g = 5.45 × 10⁵ J/kg
13.13 **Heat of Combustion:** −6552 Btu/lb = −7640 cal/g = −317.4 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

HDQ	# HYDROQUINONE

Common Synonyms
1,4-Benzenediol
p-Dihydroxybenzene
Hydroquinol
Pyrogentisic acid
Quinol

Solid White light tan to gray

Sinks and mixes with water

Avoid contact with solid and dust Keep people away
Shut off ignition sources Call fire department
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Dust cloud may explode if ignited in an enclosed area
Extinguish with water dry chemicals foam or carbon dioxide

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes nose and throat
Harmful if inhaled
If in eyes hold eyelids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
Will burn eyes
Irritating to eyes
If swallowed will cause headache, dizziness, nausea, vomiting or loss of consciousness

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1,4-Benzenediol, p-Dihydroxybenzene Hydroquinol, Pyrogentisic acid Quinol

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $1,4\text{-}C_6H_4(OH)_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Light tan to light gray, white

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles respirators protective dust is present

5 2 **Symptoms Following Exposure:** Ingestion can cause ringing in the ears nausea dizziness a sense of suffocation increased respiration rate vomiting pallor muscular twitchings, headache dyspnea cyanosis delirium and collapse the urine is green or brownish green Lethal adult dose is 2 grams Direct contamination of the eye with particles of hydroquinone can cause immediate irritation and may result in ulceration of the cornea Contact with skin may cause dermatitis

5 3 **Treatment for Exposure:** INGESTION induce vomiting, perform gastric lavage and follow with a saline cathartic and demulcents get medical attention EYES flush immediately with plenty of water for 15 min and get medical attention SKIN wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 2 mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, LD_{50} 320 mg/kg (rats)

5 7 **Late Toxicity:** Causes bladder cancer in mice discoloration of eyelids and eye changes in men

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** (molten) 350°F O C

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:** Dust explosion is possible

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 0 287 ppm/48 hr, goldfish/TL$_m$/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 53%, 5 days
25% (theo.), 0 5 days as catechol

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Eastman Chemical Products Inc
Kingsport Tenn 37662

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown, N J 07960

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 110 11

13 3 **Boiling Point at 1 atm:** 545°F = 285°C = 558°K

13 4 **Freezing Point:** 338°F = 170°C = 443°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 33 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −11 200 Btu/lb = −6,220 cal/g = −260 × 10^3 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6

NOTES

HAI	2-HYDROXYETHYL ACRYLATE, INHIBITED

Common Synonyms

beta-hydroxyethyl acrylate
2-Hydroxyethyl 2-propenoate

Liquid | Colorless | Sweet pleasant odor

Mixes with water

[illegible]

Fire

Combustible
Containers may explode in fire

[illegible]

Exposure

CAUTION! Medical and

LIQUID
Will burn skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes
FLUSH affected area with plenty of water
IF IN EYES, [illegible] and flush with plenty of water
IF SWALLOWED [illegible] CONSULT a poison control center
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - water contaminant
Restrict access
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** beta Hydroxyethyl acrylate
2 Hydroxyethyl 2 propenoate

3 2 **Coast Guard Compatibility Classification:** Monomers (14)

3 3 **Chemical Formula:**
$CH_2{=}CHCOOCH_2CH_2OH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Sweet, pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with liquid irritates eyes and skin

5 3 **Treatment for Exposure:** INHALATION: remove victim from exposure, support respiration, call physician if needed. EYES: wash with large amounts of water for 15 min., call physician. SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1.0 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 220°F OC

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Water, dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Containers may explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 2.0 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** In the absence of inhibitor, polymerization will occur, especially when heated

7 6 **Inhibitor of Polymerization:** Monomethyl ether of hydroquinone, 400 ppm

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich. 48640

2 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

A P Q Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	3

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 116.1

13 3 **Boiling Point at 1 atm:**
> 346°F = > 210°C = > 483°K

13 4 **Freezing Point:** -76°F = -60°C = 213°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.10 at 25°C (liquid)

13 8 **Liquid Surface Tension:** (est.)
28 dynes/cm = 0.028 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) -10 800 Btu/lb
= -6 000 cal/g = -250 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** (est.) -216 Btu/lb
= -121 cal/g = -5.06 × 10² J/kg

Continued on pages 4 and 6

NOTES

HAS — HYDROXYLAMINE SULFATE

Common Synonyms			
Oxammonium sulfate	Solid	White	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not Flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing or loss of consciousness
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea or loss of consciousness
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Restrict access
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Oxammonium sulfate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $(NH_3OH)_2SO_4$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Crystals
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Acid resistant protective clothing including coveralls, wrist length gloves, cap, goggles and dust mask
5 2 **Symptoms Following Exposure:** Inhalation of dust or ingestion may cause systemic poisoning characterized by cyanosis, methemoglobinemia, convulsions and coma. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION, remove victim to fresh air, get medical attention if symptoms occur. INGESTION, give large amount of water, induce vomiting, get medical attention. EYES, flush with water for at least 15 min., and get medical attention. SKIN, flush immediately with plenty of water, then wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3, LD_{50} 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Sulfuric acid fumes may form in fires
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May be corrosive to metals in presence of moisture
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Commercial Solvents Corp
245 Park Avenue
New York, N.Y. 10017
2 Virginia Chemicals Inc.
3340 W. Norfolk Road
Portsmouth, Va. 23703
3 Dow Badische Co.
Williamsburg, Va. 23185

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial 97, 99%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 164.14
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** >1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on next Card

NOTES

HPA — HYDROXYPROPYL ACRYLATE

Common Synonyms
Propylene glycol mono-acrylate
1,2 Propanediol-1-acrylate

Liquid | Colorless | Faint unpleasant odor

May float or sink in water

Avoid contact with liquid and vapor. Keep people away.
Shut off ignition sources. Call fire department.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
CONTAINERS MAY EXPLODE IN FIRE
Extinguish with dry chemicals, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.
COMBAT FIRE FROM SAFE DISTANCE OR PROTECTED LOCATION.

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
Will burn skin and eyes.
If swallowed will cause nausea.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearest water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - water contaminant
Restrict access
Disperse and flush

2. LABELS

No Hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2-Propanediol-1-acrylate; Propylene glycol mono-acrylate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $CH_2OHCHOHCH_2OCOCH{=}CH_2$
3.4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Slightly acrylic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, apron and boots; worker's goggles or face shield
5.2 **Symptoms Following Exposure:** Inhalation irritates nose and throat and causes coughing; lung injury may occur. Ingestion causes irritation and burning of mouth and stomach. Vapor irritates eyes. Contact with liquid causes severe burns of eyes and burns of skin.
5.3 **Treatment for Exposure:** INHALATION: if ill effects occur, get patient to fresh air, keep him quiet and warm, and get medical attention if breathing stops, start artificial respiration. INGESTION: force milk or water immediately, induce vomiting only at physician's recommendation. EYES: promptly flush with plenty of water and get medical attention. SKIN: promptly flush with plenty of water, get medical attention if burning occurs.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1,230 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 212°F OC
6.2 **Flammable Limits in Air:** 1.8% (LEL)
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** May occur, avoid exposure to high temperatures, ultraviolet light, free radical initiators
7.6 **Inhibitor of Polymerization:** 200 ppm hydroquinone

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (30D):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Design Products Dept.
Midland, Mich. 48640
2. Polysciences, Inc.
Paul Valley Industrial Park
Warrington, Pa. 18976

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial 97%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-4)

A P Q Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	1
Self-Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 130
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.06 at 25°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 4.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Data not available
13.13 **Heat of Combustion:** (est.) −12,300 Btu/lb = −6,850 cal/g = −287 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Data not available

(Continued on page 7 and 8)

NOTES

HPM	HYDROXYPROPYL METHACRYLATE

Common Synonyms Propylene glycol monometh-acrylate 1,2 Propanediol 1-meth-acrylate	Liquid	White	Slight unpleasant odor
	May float or sink in water		

[redacted]

Fire

Combustible
CONTAINERS MAY EXPLODE IN FIRE
[redacted]

Exposure

[redacted]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[redacted]

LIQUID
Will burn eyes
Irritating to eyes
If swallowed will cause nausea and vomiting
[redacted]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[redacted]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4.

Issue warning - water contaminant
Restrict access
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1,2 propanediol 1 methacrylate, Propylene glycol monomethacrylate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $CH_2CHOHCH_2OCOC(CH_3)=CH_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Slight acrylic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes coughing and irritation of nose and throat, lung injury may occur. Ingestion causes irritation and burning of mouth and stomach. Contact of vapor with eyes causes irritation. Liquid may cause severe eye burns and irritation of skin.

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, if required, start artificial respiration and call a doctor. INGESTION: force milk or water at once, get medical attention. EYES: flush with water for at least 15 min., get medical attention if irritation persists. SKIN: flush with water, get medical attention for burns.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1, LD_{50} 5 15 g/kg (mouse)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 290°F (CC)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:** Compound may polymerize when hot and burst container

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** May polymerize when hot or when exposed to ultraviolet light and free radical catalysts

7 6 **Inhibitor of Polymerization:** 200 ppm hydroquinone

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Rohm and Haas
Independence Mall
W. Philadelphia, Pa 19105

2 Polysciences Inc.
Paul Valles Industrial Park
Warrington, Pa 18976

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 95+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3.

NPQ/

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 144

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.06 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Data not available

Continued on page 4 and 5

NOTES

IAA

ISOAMYL ALCOHOL

Common Synonyms
Fusel oil
Fermentation amyl alcohol
Impentyl alcohol
3-Methyl-1-butanol

Liquid | Colorless | Mild, choking alcohol odor

Floats and mixes with water. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with water fog, carbon dioxide, dry chemical, alcohol foam or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose, and throat
Harmful if inhaled
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to eyes.
IF IN EYES, hold eyelids open and flush with plenty of water.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water supplies.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Fermentation amyl alcohol; Fusel oil; Isobutylcarbinol; Isopentyl alcohol; 3-Methyl-1-butanol; Pentyl alcohol; sec-Amyl alcohol

3.2 **Coast Guard Compatibility Classification:** Xylene

3.3 **Chemical Formula:** $(CH_3)_2CHCH_2CH_2OH$

3.4 **IMCO United Nations Numerical Designations:** 1.3 (no. 1.2.120)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild odor, alcoholic, non-resinous

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Face shield to avoid splash.

5.2 **Symptoms Following Exposure:** Very high vapor concentrations irritate eyes and upper respiratory tract. Continued contact with skin may cause irritation.

5.3 **Treatment of Exposure:** EYES: immediately flush with plenty of water for at least 15 minutes, get medical attention. SKIN: Wash with water, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; LD$_{50}$: 0.5 to 5 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Liquid may cause irritation.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 114°F (O.C.)

6.2 **Flammable Limits in Air:** 1.2% - 9.0% (112°F)

6.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam, or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.

6.5 **Special Hazards of Combustion Products:** Not pertinent.

6.6 **Behavior in Fire:** Not pertinent.

6.7 **Ignition Temperature:** 662°F

6.8 **Electrical Hazard:** Class I, Group C

6.9 **Burning Rate:** 1.6 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 100 ppm/ 82 hr goldfish/ tetrahymena/ fresh water; 400-640 ppm/ 24 hr/ green crab/ survival range/ river water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 1.96% 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Pubochem Industries Inc.
1429 Walnut St.
Philadelphia, Pa. 19102
2. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure fusel oil

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

S.P.Q.T.U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 88.15

13.3 **Boiling Point at 1 atm:** 270°F = 132°C = 405°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** 584°F = 307°C = 580°K

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.81 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 23.6 dynes/cm = 0.0236 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 5 dynes/cm = 0.005 N/m at 19°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.052 at 1 atm

13.12 **Latent Heat of Vaporization:** 2.5 x 10^2 Btu/lb = 139 cal/g = 5.81 x 10^5 J/kg

13.13 **Heat of Combustion:** -14,200 Btu/lb = -7900 cal/g = -330.7 x 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** -47.1 Btu/lb = -26.2 cal/g = -1.11 x 10^5 J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

IBT	# ISOBUTANE

Common Synonyms
2-Methylpropane

Liquefied compressed gas Colorless Odorless

Floats and boils on water Flammable vapor cloud is produced

Stop discharge if possible Keep people away
Shut off ignition sources and call fire department
Use [illegible] water spray Dilute and disperse
Dike for containment Notify local health and pollution control agencies

Fire

FLAMMABLE.
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Stop flow of gas if possible
Use [illegible] water

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes.
If inhaled, will cause dizziness, difficult breathing or loss of consciousness
Move victim to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen
IN EYES: Immediately wash eyes out with plenty of water

Water Pollution

Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-6)

Issue warning: high flammability
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2-Methylpropane
3 2 **Coast Guard Compatibility Classification:** Paraffin
3 3 **Chemical Formula:** C_4H_{10} or $CH(CH_3)_3$
3 4 **IMCO United Nations Numerical Designation:** 2.0 1969

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied under pressure
4 2 **Color:** Colorless
4 3 **Odor:** Faint gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus; safety goggles
5 2 **Symptoms Following Exposure:** Central nervous system depression ranging from dizziness and stupefaction to anesthesia and respiratory arrest, dependent on concentration and extent of inhalation. Irregular heartbeat may be a dangerous concomitant to anesthetic action.
5 3 **Treatment for Exposure:** INHALATION: proper victim removal with use of self-contained breathing apparatus by person outfitted or anesthetized; apply artificial respiration if breathing has stopped; avoid administration of epinephrine or other sympathomimetic amines; prevent aspiration of vomitus by proper positioning of head; give symptomatic and supportive treatment. INGESTION OR ASPIRATION: no treatment required
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Not pertinent
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to skin because it is very volatile and evaporates quickly. Some frostbite possible.
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** [illegible] °C CC
6 2 **Flammable Limits in Air:** [illegible]
6 3 **Fire Extinguishing Agents:** Stop flow of gas
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** [illegible]°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** None
8 2 **Waterfowl Toxicity:** None
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield Co
ARCO Chemical Co Division
260 South Broad St
Philadelphia, Pa 19101

2 Cities Service Co Inc
Petrochemicals Division
60 Wall St
New York, N Y 10005

3 Phillips Petroleum Co
Bartlesville, Okla 74004

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure, technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

ABCDEFG

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas
12 2 **MAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas
13 2 **Molecular Weight:** 58.12
13 3 **Boiling Point at 1 atm:** [illegible] °C = [illegible] °F = [illegible] K
13 4 **Freezing Point:** [illegible] °C = [illegible] °F = [illegible] K
13 5 **Critical Temperature:** [illegible] °C = [illegible] °F = [illegible] K
13 6 **Critical Pressure:** [illegible] atm = [illegible] MPa
13 7 **Specific Gravity:** [illegible] at [illegible] °C (liquid)
13 8 **Liquid Surface Tension:** [illegible] dyn/cm = [illegible] N/m at [illegible] °C
13 9 **Liquid-Water Interfacial Tension:** [illegible] dyn/cm = [illegible] N/m at [illegible] °C
13 10 **Vapor (Gas) Specific Gravity:** [illegible]
13 11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13 12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kJ/kg
13 13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kJ/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(continued on page 7 and 8)

NOTES

REVISED 1978

IBA — ISOBUTYL ACETATE

Common Synonyms
Acetic acid, isobutyl ester

Watery liquid | Colorless | Pleasant fruity odor

Floats on water. Flammable, irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
May explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, vomiting, dizziness or loss of consciousness

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Acetic acid isobutyl ester
2 Methyl-1 propyl acetate
Beta Methylpropyl ethanoate

3 2 **Coast Guard Compatibility Classification** 1 star

3 3 **Chemical Formula** $CH_3COOCH_2CH(CH_3)_2$

3 4 **IMCO/United Nations Numerical Designation** 3.2, 1213

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color** Colorless

4 3 **Odor:** Agreeable fruity odor in low concentrations, disagreeable in higher concentrations, mild characteristic ester, nonresidual

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air pack or organic canister mask, chemical goggles

5 2 **Symptoms Following Exposure:** Vapor may irritate upper respiratory tract and cause nausea, vomiting, dizziness and loss of consciousness. Liquid irritates eyes and may irritate skin

5 3 **Treatment for Exposure** INHALATION - remove from exposure, if breathing is irregular or has stopped, start resuscitation and give oxygen, call a doctor. EYES - flush with water for at least 15 minutes

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 150 ppm

5 5 **Short-Term Inhalation Limit:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 62°F C.C., 85°F O.C.

6 2 **Flammable Limits in Air:** 2.4% - 10.5%

6 3 **Fire Extinguishing Agents:** Foam, carbon dioxide and dry chemical

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 793°F

6 8 **Electrical Hazard.** Class I, group D

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Softens and dissolves many plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 1200 ppm/24 hr/brine shrimp/TLm

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 47% of theoretical in 5 days, freshwater, acclimated seed

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Eastman Kodak Co
Tennessee Eastman Division
Kingsport, Tenn. 37662

2 Fritzsche, Dodge and Olcott, Inc.
76 Ninth Ave.
New York, N.Y. 10011

3 Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 95-99+%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

ATU

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 116.16

13 3 **Boiling Point at 1 atm** 243.1°F = 117.3°C = 390.5°K

13 4 **Freezing Point** -142.5°F = -97.5°C = 176.1°K

13 5 **Critical Temperature.** 565°F = 296°C = 569°K

13 6 **Critical Pressure** 470 psia = 32 atm = 3.2 MN/m

13 7 **Specific Gravity** 0.871 at 20°C (liquid)

13 8 **Liquid Surface Tension** 23.7 dynes/cm = 0.0237 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** (est.) 40 dynes/cm = 0.04 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** 133 Btu/lb = 73.7 cal/g = 3.09 × 10⁵ J/kg

13 13 **Heat of Combustion** (est.) = -13 000 Btu/lb = -7220 cal/g = -302 × 10⁵ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

IAL

ISOBUTYL ALCOHOL

Common Synonyms
Isobutanol
Isopropylcarbinol
2-Methyl-1-propanol

Oily liquid | Colorless | Mild alcohol, choking odor

Floats and mixes slowly with water. Irritating vapor is produced.

Stop discharge if possible.
Call fire department.
Avoid contact with liquid and vapor.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam, carbon dioxide.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, dizziness or headache.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to eyes.
Harmful if swallowed.
IF IN EYES: Hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

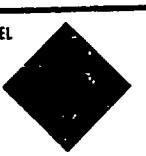
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Isobutanol
Isopropylcarbinol
2 methyl 1-propanol
Fermentation butyl alcohol

3 2 **Coast Guard Compatibility Classification:** Alcohol

3 3 **Chemical Formula:** $(CH_3)_2CHCH_2OH$

3 4 **IMCO/United Nations Numerical Designation:** 3 3/1212

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Slightly suffocating nonresidual alcoholic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air sack or organic canister chemical goggles

5 2 **Symptoms Following Exposure:** Contact with eyes is extremely irritating and may cause burns. Breathing vapors will be irritating to the nose and throat. In high concentrations, may cause nausea, dizziness, headache and stupor.

5 3 **Treatment for Exposure:** INHALATION: if victim is overcome by vapors, remove him from exposure immediately, call a physician. If breathing is irregular or has stopped, start resuscitation, administer oxygen. EYES: flush with water for at least 15 min.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5 5 **Short-Term Inhalation Limit:** 200 ppm for 60 min

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 to 5 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 82°F C.C. 90°F O.C.

6 2 **Flammable Limits in Air:** 1.6% - 10.9%

6 3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 800°F

6 8 **Electrical Hazard:** Class I, group D

6 9 **Burning Rate:** 3.5 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 4686 ppm/1 hr/fish/lethal/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 162%, 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Eastman Kodak Co
Tennessee Eastman Division
Kingsport, Tenn 37662

2 Oxochem Enterprises
Penuelas, Puerto Rico 00724

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 74.12

13 3 **Boiling Point at 1 atm:** 226.2°F = 107.9°C = 381.1°K

13 4 **Freezing Point:** -162°F = -108°C = 165°K

13 5 **Critical Temperature:** 526.3°F = 274.6°C = 547.8°K

13 6 **Critical Pressure:** 623 psia = 42.4 atm = 4.30 MN/m²

13 7 **Specific Gravity:** 0.802 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 248 Btu/lb = 138 cal/g = 5.78 × 10⁵ J/kg

13 13 **Heat of Combustion:** -14 220 Btu/lb = -7 900 cal/g = -330.8 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

IAM ISOBUTYLAMINE

Common Synonyms
Monoisobutylamine
1-Amino-2-methylpropane

Liquid | Colorless | Strong ammonia odor

Floats and mixes with water

Stop discharge if possible. Keep people away.
Shut off ignition sources. Call fire department.
Avoid contact with liquid and vapor.
Isolate and ventilate area.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals, alcohol foam, carbon dioxide.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing, difficult breathing or loss of consciousness
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
If swallowed will cause nausea or loss of consciousness
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is CONSCIOUS, induce vomiting by drinking water or milk and then sticking finger down throat.

Water Pollution

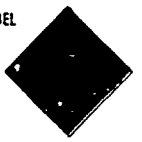
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of downstream water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability, air contaminant, water contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Amino-2-methylpropane; Iso Butylamine; Monoisobutylamine
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $(CH_3)_2CHCH_2NH_2$
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1214

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Strong ammoniacal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus, butyl rubber gloves, chemical face shield, butyl rubber apron
5.2 **Symptoms Following Exposure:** Inhalation causes severe coughing and chest pain due to irritation of air passages, can cause lung edema. Compound is sympathomimetic and is also a cardiac depressant, and convulsant. Ingestion causes nausea and profuse salivation. Contact with eyes causes severe irritation and edema of the cornea. Contact with skin causes severe irritation.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, if he is not breathing, give artificial respiration, if breathing is difficult, give oxygen, call a physician. INGESTION: give large amount of water followed by dilute vinegar or lemon juice, keep patient warm. EYES: flush with water for 15 min. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} = 120 mg/kg (rabbit); 250 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 15°F C.C.
6.2 **Flammable Limits in Air:** 1.8% - 9%
6.3 **Fire Extinguishing Agents:** Dry chemical, "alcohol" foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in fire
6.6 **Behavior in Fire.** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode.
6.7 **Ignition Temperature:** 712°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 6.03 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Air Products and Chemicals, Inc.
U.S. Highway 90
Pace, Fla. 32502

2 Pennwalt Corp.
Three Parkway
Philadelphia, Pa. 19102

3 Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q-R-S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 73.1
13.3 **Boiling Point at 1 atm:** 153.3°F = 67.4°C = 340.6°K
13.4 **Freezing Point:** −121.9°F = −85.5°C = 187.7°K
13.5 **Critical Temperature:** 469.4°F = 243.0°C = 516.2°K
13.6 **Critical Pressure:** 620 psia = 42 atm = 4.3 MN/m²
13.7 **Specific Gravity:** 0.739 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 23.70 dynes/cm = 0.0237 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.073 at 20°C
13.12 **Latent Heat of Vaporization:** 182 Btu/lb = 101 cal/g = 4.23×10^5 J/kg
13.13 **Heat of Combustion:** −17,540 Btu/lb = −9,760 cal/g = -408×10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** −148 Btu/lb = −82 cal/g = -3.4×10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

IBL

ISOBUTYLENE

Common Synonyms
Isobutene
2-Methylpropene

Liquefied compressed gas Colorless Sweet gasoline like odor

Floats and boils on water. Flammable visible vapor cloud is produced

No ignition sources (No flares, smoking or flames in hazard area). Shut off ignition sources and all fire department apparatus. Stay upwind and keep water spray on knock down vapors. Avoid contact with liquid. Isolate and remove leaking gas container if safe to do so. Notify local fire and police authorities.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Stop flow of gas if possible.
Cool exposed containers with water. Fog fire. Use dry chemical, carbon dioxide, or water.
Let fire burn.
Extinguish small fires with water, dry chemical, carbon dioxide, or foam.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose, and throat.
If inhaled, will cause dizziness or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will cause frostbite.
Flush affected areas with plenty of water.
DO NOT RUB AFFECTED AREAS.

Water Pollution

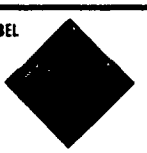
Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: highly flammable.
Restrict access.
Evacuate area.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Isobutene
2-Methylpropene

3.2 **Coast Guard Compatibility Classification**
Olefin

3.3 **Chemical Formula:** $(CH_3)_2C=CH_2$

3.4 **IMCO/United Nations Numerical Designation:** 2 1055

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid under pressure

4.2 **Color:** Colorless

4.3 **Odor:** Mild sweetish

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical gloves and eye protection, organic vapor canister or self-contained breathing apparatus.

5.2 **Symptoms Following Exposure:** Inhalation of moderate concentrations causes dizziness, drowsiness and unconsciousness. Contact with eyes or skin may cause irritation. The liquid may cause frostbite.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air and apply resuscitation; call a physician promptly if victim is unconscious. EYES: if irritated, wash with water. SKIN: if irritated, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm (8 hr)

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to eyes and throat.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to skin because it is very volatile and evaporates quickly. May cause frostbite.

5.10 **Odor Threshold:** Data not available

FIRE HAZARDS

6.1 **Flash Point:** −105°F C.C.

6.2 **Flammable Limits in Air**
1.8% 9.6%

Fire Extinguishing Agents: Let fire burn; stop flow of gas. Water fog, dry chemical or carbon dioxide, may be used for small fires.

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire.** Containers may explode in fire. Vapor is heavier than air and may travel a long distance to a source of ignition and flash back.

6.7 **Ignition Temperature:** 869°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD).**
None

8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Petro-Tex Chemical Corp
8600 Park Place
Houston, Texas 77017

2 Exxon Chemical Co
Houston, Texas 77001

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Commercial polymerization

10.2 **Storage Temperature:**
Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Safety relief

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3)

A B C D-E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 56.10

13.3 **Boiling Point at 1 atm:**
19.6°F = −6.9°C = 266.3°K

13.4 **Freezing Point.**
−220°F = −140.3°C = 132.9°K

13.5 **Critical Temperature:**
292.5°F = −144.2°C = 417.9°K

13.6 **Critical Pressure:**
580 psia = 39.48 atm = 3.99 MN/m

13.7 **Specific Gravity:** 0.59 at 20°C (liquid)

13.8 **Liquid Surface Tension**
15.8 dynes/cm = 0.0158 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.**
(est.) 40 dynes/cm = 0.04 N/m at −10°C

13.10 **Vapor (Gas) Specific Gravity:** 1.9

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.061

13.12 **Latent Heat of Vaporization**
170 Btu/lb = 94.3 cal/g = 3.95 × 10⁵ J/kg

13.13 **Heat of Combustion:** −19,369 Btu/lb
= −10,755 cal/g = −450.29 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

IBR

ISOBUTYRIC ACID

Common Synonyms			
Dimethylacetic acid Isopropylformic acid 2 Methylpropanoic acid Propane-2-carboxylic acid	Liquid	Colorless	Unpleasant, acrid odor
	Floats and mixes with water		

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self contained breathing apparatus and rubber protective clothing including gloves.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Not
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
Will burn skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and pollution control agencies.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dimethylacetic acid, Isopropylformic acid, 2 Methylpropanoic acid, Alpha Methylpropionic acid, Propane-2-carboxylic acid

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(CH_3)_2CHCOOH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Unpleasant, acrid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic chemical respirator, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min., get medical attention if irritation persists. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 280 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 170°F C C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 935°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 2.6 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Corrosive to aluminum and other metals. Flammable hydrogen gas may accumulate in enclosed spaces.

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 American Hoechst Corp
Route 202 206 North
Somerville, N J 08876

2 BASF Wyandotte
1609 Biddle Avenue
Wyandotte, Mich 48192

3 Eastman Organic Chemicals
343 State Street
Rochester, N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 88

13 3 **Boiling Point at 1 atm:** 309°F = 154°C = 427°K

13 4 **Freezing Point:** −51°F = −46°C = 227°K

13 5 **Critical Temperature:** 637°F = 336°C = 609°K

13 6 **Critical Pressure:** 588 psia = 40 atm = 4.06 MN/m²

13 7 **Specific Gravity:** 0.949 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 25.1 dynes/cm = 0.0251 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 3.0

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 202 Btu/lb = 112 cal/g = 4.68 × 10⁵ J/kg

13 13 **Heat of Combustion:** −10,600 Btu/lb = −5,880 cal/g = −246 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** −20.5 Btu/lb = −11.4 cal/g = −0.477 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

IBN — ISOBUTYRONITRILE

Common Synonyms
Isopropyl Cyanide
IBN
2-Methylpropanenitrile
2-Methylpropionitrile

Liquid | Colorless | Almond-like

Floats on water. Flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat
[illegible]

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
[illegible]

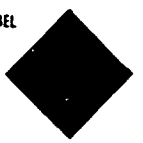
Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

Issue warning: high flammability, poison
Restrict access
Evacuate area
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** IBN, Isopropyl cyanide, 2-Methylpropanenitrile, 2-Methylpropionitrile
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** $(CH_3)_2CHCN$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Like almonds or benzaldehyde

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, goggles, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation, ingestion or skin contact causes weakness, headache, confusion, nausea, vomiting, acute cyanide poisoning may result. Contact with eyes causes irritation
5 3 **Treatment for Exposure:** *Get medical attention following all overexposures to this chemical. Watch for symptoms of cyanide poisoning.* INHALATION: move patient to fresh air, apply artificial respiration if breathing stops. INGESTION: break an amyl nitrite pearl in a cloth and hold lightly under patient's nose for 15 sec., if he is conscious, induce vomiting and repeat until vomit is clear, repeat inhalation of amyl nitrite 5 times at 15 sec. intervals. EYES: flush with water for at least 15 min. SKIN: flush with water, remove contaminated clothing, destroy contaminated shoes
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Grade 3, oral LD_{50} = 100 mg/kg (rats)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 47°F C.C.
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Air Products and Chemicals, Inc.
P.O. Box 538
Allentown, Pa. 18105

2 Ivemstar Corp.
P.O. Box 68
Scarborough, N.Y. 10510

3 Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, Pure
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T U-Y-W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 69.1
13 3 **Boiling Point at 1 atm:** 219°F = 104°C = 377°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Data not available
13 6 **Critical Pressure:** Data not available
13 7 **Specific Gravity:** 0.774 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 24.9 dynes/cm = 0.0249 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** 2.4
13 11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13 12 **Latent Heat of Vaporization:** 200 Btu/lb = 110 cal/g = [illegible] × 10^4 J/kg
13 13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] 310 cal/g = 348 × 10^4 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

IOC ISOOCTALDEHYDE

Common Synonyms
6-Methyl-1 heptanal
Oxo octaldehyde
Isooctylaldehyde

Liquid | Colorless | Mild fruity odor

Floats on water

Notify fire department if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam, carbon dioxide

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to eyes
IF IN EYES: Hold eyelids open and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-2)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dimethylhexanals
Isooctyl aldehyde
6-Methyl-1 heptanal

3 2 **Coast Guard Compatibility Classification:** Aldehyde

3 3 **Chemical Formula:** $(CH_3)_2CH(CH_2)_3CHO$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild fruity

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles

5 2 **Symptoms Following Exposure:** High vapor concentrations produce eye irritation Liquid may irritate eyes

5 3 **Treatment for Exposure:** Remove from exposure Wash eyes with water for 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard Practically harmless to the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 104°F C C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Data not available

6 4 **Fire Extinguishing Agents Not to be Used:** Data not available

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 320°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston, Texas 77001

2 Getty Oil Co
Los Angeles, Calif 90054

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A-T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 128 22

13 3 **Boiling Point at 1 atm:** 307 352°F = 153 178°C = 426 451°K

13 4 **Freezing Point:** −180°F = −118°C = 155°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 82⁵ at 20°C (liquid)

13 8 **Liquid Surface Tension:** 26 9 dynes/cm = 0 0269 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est) 40 dynes/cm = 0 04 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** (est) 1 040

13 12 **Latent Heat of Vaporization:** 140 Btu/lb = 77 cal/g = 3 2 × 10⁵ J/kg

13 13 **Heat of Combustion:** (est) −17 000 Btu/lb = −9600 cal/g = −400 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

IDA

ISODECALDEHYDE

Common Synonyms: Isodecaldehyde mixed isomers	Liquid	Colorless	Fruity odor
	Floats on water		

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be recovered
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Isodecaldehyde mixed isomers; Trimethylheptanals
3 2 **Coast Guard Compatibility Classification:** Aldehyde
3 3 **Chemical Formula:** $C_{10}H_{20}O$
3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Somewhat fruity

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing, chemical goggles
5 2 **Symptoms Following Exposure:** Low general toxicity. Liquid may cause irritation and skin
5 3 **Treatment for Exposure:** Wash eyes and skin with plenty of water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on skin, prolonged and allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 185°F (C.C.)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 156.28
13 3 **Boiling Point at 1 atm:** Data not available
13 4 **Freezing Point:** Data not available
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est.) 0.84 at 15° (liquid)
13 8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.02 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Data not available
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continues on page 7 and 8)

NOTES

REVISED 1978

IAI ISODECYL ACRYLATE, INHIBITED

Common Synonyms
Isodecyl acrylate

Liquid | Colorless | Weak odor

Floats on water

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemicals, CO2, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

LIQUID
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED, do not induce vomiting. If conscious, have victim drink water.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** iso Decyl acrylate
3 2 **Coast Guard Compatibility Classification:** Monomers (14)
3 3 **Chemical Formula:** $CH_2=CHCOOC_{10}H_{21}$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Weak acrylate

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation causes mild irritation of nose and throat. Eyes are mildly irritated by vapor, more severely by liquid. Prolonged contact of liquid with skin may cause irritation.
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water for at least 15 min. after contact with liquid. SKIN: wipe off, wash well with soap and water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 1. LD50 5 to 15 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 240°F O.C.
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** May polymerize to gummy solid. Reaction is not violent.
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable if inhibited
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** In the absence of inhibitor polymerization will occur, especially when heated.
7 6 **Inhibitor of Polymerization:** Monomethyl ether of hydroquinone, 25 ppm

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 97.5+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X I U /

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	2
Reactions	
Other Chemicals	2
Water	0
Self Reaction	3

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 212.4
13 3 **Boiling Point at 1 atm:** Not pertinent (polymerizes)
13 4 **Freezing Point:** −148°F = −100°C = 173°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.885 at 20°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** 110 Btu/lb = 61 cal/g = 2.6 × 10⁵ J/kg
13 13 **Heat of Combustion:** (est.) −16,300 Btu/lb = −9,100 cal/g = −380 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** (est.) −119 Btu/lb = −66 cal/g = −2.8 × 10⁵ J/kg

Continued on pages 5 and 6

NOTES

ISA ISODECYL ALCOHOL

Common Synonyms	Liquid	Colorless	Mild alcohol odor
	[illegible] on water		

Fire	Combustible
Exposure	LIQUID Will burn skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Alcohol
3 3 **Chemical Formula:** $C_{10}H_{21}OH$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Weak alcoholic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles
5 2 **Symptoms Following Exposure:** Direct contact with skin can produce irritation
5 3 **Treatment for Exposure:** Wash affected area with water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat
5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure may cause secondary burns on long exposure
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 220°F O C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Alcohol foam, dry chemicals or carbon dioxide
6 4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston Texas 77001
2 Getty Oil Co
Los Angeles Calif 90054
3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N Y 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical mixed isomers
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	2
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 158.29
13 3 **Boiling Point at 1 atm:** 428°F = 220°C = 493°K
13 4 **Freezing Point:** <140°F = <60°C = <333°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.841 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.032
13 12 **Latent Heat of Vaporization:** (est.) 120 Btu/lb = 67 cal/g = 2.8 × 10⁵ J/kg
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6

NOTES

REVISED 1978

IHA

ISOHEXANE

Common Synonyms
* Methylpentane

Watery liquid

Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting

Water Pollution

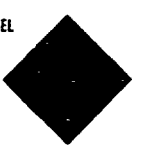
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Evacuate area
Disperse and flush

2 LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2 Methylpentane
3 2 **Coast Guard Compatibility Classification:** Paraffin
3 3 **Chemical Formula:** $CH_3CH(CH_3)CH_2CH_3$
3 4 **IMCO/United Nations Numerical Designation:** 3 1/1208

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Eye protection (as for gasoline)
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract, cough, mild depression, cardiac arrhythmias. Aspiration causes severe lung irritation, coughing, pulmonary edema, excitement followed by depression. Ingestion causes nausea, vomiting, swelling of abdomen, headache, depression
5 3 **Treatment for Exposure:** INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, give oxygen. INGESTION: do NOT induce vomiting, call a doctor. EYES: wash with copious amount of water. SKIN: wipe off, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limit:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat
5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** −20°F C.C.
6 2 **Flammable Limits in Air:** 1.2% - 7.7%
6 3 **Fire Extinguishing Agents:** Foam, carbon dioxide or dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 585°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 8.7 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 The Humphrey Chemical Co
Devine Street
North Haven Conn 06473

2 Penzoil United Inc
Atlas Processing Co
3546 Midway St
Shreveport La 71109

3 Phillips Petroleum Co
Bartlesville Okla 74004

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Research 99.95% pure 99.0%, technical 95.0%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U-V-W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 86 lb
13 3 **Boiling Point at 1 atm:** 140.5°F = 60.3°C = 333.5°K
13 4 **Freezing Point:** −244.6°F = −153.7°C = 119.5°K
13 5 **Critical Temperature:** 435.7°F = 224.3°C = 497.5°K
13 6 **Critical Pressure:** 437 psia = 29.7 atm = 3.01 MN/m²
13 7 **Specific Gravity:** 0.653 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 17.38 dynes/cm = 0.01738 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** 2.9
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.062
13 12 **Latent Heat of Vaporization:** 139 Btu/lb = 77.1 cal/g = 3.23 × 10⁵ J/kg
13 13 **Heat of Combustion:** −19,147 Btu/lb = −10,637 cal/g = −445.35 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

10A

ISOOCTYL ALCOHOL

Common Synonyms
6-Methyl-1-heptanol
Octyl alcohol

Liquid | Colorless | Mild odor

Floats on water

[illegible] discharge if possible
[illegible] Department
Avoid [illegible] with skin
In case of [illegible] seek medical [illegible]
[illegible]

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IF EXPOSED: [illegible]
IF SWALLOWED: [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Should be retained
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dimethyl hexanols
6-Methyl-1-heptanol

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $(CH_3)_2CH(CH_2)_5CH_2OH$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild, characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask in confined areas; plastic gloves, goggles, eye bath and safety shower

5.2 **Symptoms Following Exposure:** Inhalation hazard slight. Skin contact results in moderate irritation. Liquid contact with eyes causes severe irritation and possible eye damage

5.3 **Treatment for Exposure:** Remove to fresh air. Flush skin and eye contact area at once for at least 15 min. Get medical care for eyes

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD$_{50}$ 0.5 to 5 g/kg (lab animals)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 180°F O.C.

6.2 **Flammable Limits in Air:**
0.9% (calc.) 5.7% (est.)

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 530°F (est.)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston, Texas 77001

2 Getty Oil Co
Los Angeles, Calif. 90054

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+% (mixed isomers)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-I-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 130.22

13.3 **Boiling Point at 1 atm:**
367°F = 186°C = 459°K

13.4 **Freezing Point:**
<212°F = <100°C = <173°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.832 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
29.5 dynes/cm = 0.0295 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
(est.) 40 dynes/cm = 0.04 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.040

13.12 **Latent Heat of Vaporization:**
(est.) 140 Btu/lb = 77 cal/g = 3.2 × 10^5 J/kg

13.13 **Heat of Combustion:** (est.) −17,500 Btu/lb = −9650 cal/g = −404 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

IPT	# ISOPENTANE

Common Synonyms
2-Methylbutane

Watery liquid | Colorless | Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced.
Boiling point is 82°F

[illegible]

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
[illegible]

Exposure

[illegible]

VAPOR
Irritating to nose and throat.
If inhaled will cause coughing, difficult breathing or loss of consciousness.
[illegible]

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting.
[illegible]

Water Pollution

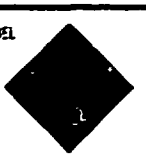
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - high flammability
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Methylbutane
3.2 **Coast Guard Compatibility Classification:** Paraffin
3.3 **Chemical Formula:** $(CH_3)_2CHC_2H_5$
3.4 **IMCO United Nations Numerical Designation:** 3 1 1217

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Use protection (as for gasoline)
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract, cough, mild depression, irregular heartbeat. Aspiration causes severe lung irritation, coughing, pulmonary edema, excitement followed by depression. Ingestion causes nausea, vomiting, swelling of abdomen, headache, depression.
5.3 **Treatment for Exposure:** INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, give oxygen. INGESTION: do NOT induce vomiting, call a doctor. EYES: wash with copious amounts of water. SKIN: wipe off, wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1 [illegible]
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to the eyes and throat.
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** −70°F (C.C.) (approx.)
6.2 **Flammable Limits in Air:** 1.4% to 7%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** If gets volatile liquid. Vapors may explode when mixed with air.
6.7 **Ignition Temperature:** 800°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 7.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pentrol United Inc.
Atlas Processing Co.
1506 Madison St.
Shreveport, La. 71101
2 Phillips Petroleum Co.
Bartlesville, Okla. 74004

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Research 99.9%
pure 99.8% technical 95%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T E V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poison	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
(Other Chemicals)	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 72.15
13.3 **Boiling Point at 1 atm:**
82.2°F = 27.9°C = 301.1°K
13.4 **Freezing Point:**
−255.8°F = −159.9°C = 113.3°K
13.5 **Critical Temperature:**
369.0°F = 187.2°C = 460.4°K
13.6 **Critical Pressure:**
441.0 psia = 30.0 atm = 3.04 MN/m²
13.7 **Specific Gravity:** 0.620 at 20°C (liquid)
13.8 **Liquid Surface Tension:**
16.05 dynes/cm = 0.01605 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:**
31 dynes/cm = 0.031 N/m at 22.7°C
13.10 **Vapor (Gas) Specific Gravity:** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.07
13.12 **Latent Heat of Vaporization:**
146 Btu/lb = 81 cal/g = 3.39 × 10⁵ J/kg
13.13 **Heat of Combustion:** −19,514 Btu/lb
= −10,841 cal/g = −453.24 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 4 and 5)

NOTES

REVISED 1978

IPH	ISOPHORONE

Common Synonyms			
3,5,5-Trimethyl-2-cyclohexene-1-one	Liquid	Colorless	Camphor-like odor
	Floats and mixes slowly with water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Boat spotting
Personnel
Mechanical containment
Should be removed
Chemical and physical properties

2. LABELS

Not specifically listed by Code
Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 3,5,5-Trimethyl-2-cyclohexene-1-one

3.2 **Coast Guard Compatibility Classification:** Ketone

3.3 **Chemical Formula:** $C_9H_{14}O$ or $(CH_3)_2C_6H_7(O)CH_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Camphor-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Not specifically listed; Self-contained breathing apparatus; Protective clothing; Other gear

5.2 **Symptoms Following Exposure:** Inhalation irritates eyes, nose and throat, causes central depression and has some anesthetic effect. Contact: Liquid with eyes causes severe irritations and possible corneal damage. Not absorbed by liquid and may cause dermatitis. Ingestion: Irritation of mouth and stomach.

Treatment for Exposure: INHALATION: Remove victim to uncontaminated atmosphere. If breathing has stopped, give artificial respiration and oxygen. EYES: Flush with water. Obtain medical attention. SKIN: Wash with soap. INGESTION: DO NOT induce vomiting. Call a doctor.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} = 2.0 g/kg for rats

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation of eyes and nose; personnel will find high concentrations unpleasant. The effects are temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes reddening of the skin and 1st degree burns on short exposure; may cause second degree burns on long exposure.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 205°F (OC); 96°F (CC)

6.2 **Flammable Limits in Air:** 1.1% - 3.8%

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 460°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.0 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:** Not reactive

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 48 hr ppm LC50 marine shrimp: 1.1

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Exxon Chemicals
P.O. Box 1272
Houston, Texas 77001

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

APQTT

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Long-term Effect	
Reactivity	
Other Chemicals	
Water	
Self Reaction	

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 138.21

13.3 **Boiling Point at 1 atm:** 419°F = 215°C = 488°K

13.4 **Freezing Point:** 28.4°F = -2.0°C = 271°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.92 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 32 dynes/cm at 25°C (77°F)

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 4.76

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 195 Btu/lb = 3.14 x 10^3 J/kg

13.13 **Heat of Combustion:** -16,700 Btu/lb = -3.88 x 10^7 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1-and-a

NOTES

IPL

ISOPHTHALIC ACID

Common Synonyms
benzene 1,3-dicarboxylic acid
m-Phthalic acid

Solid | White | Slight unpleasant odor

Sinks in water

Avoid contact with solid and dust. Keep people away.
Stop discharge if possible.
Shut off ignition sources. Call fire department.
Isolate and recover discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Dust cloud may explode if ignited in an enclosed area.
Extinguish with water, dry chemicals, foam, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR IS HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Method, Handbook CG 446-4)

Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Benzene 1,3-dicarboxylic acid; m-Phthalic acid
3.2 **Coast Guard Compatibility Classification.** Not listed
3.3 **Chemical Formula**
1,3 $C_6H_4(COOH)_2$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** Slightly acrid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** If without adequate ventilation, use respirator with dust filter, goggles, and gloves.
5.2 **Symptoms Following Exposure.** May cause slight to moderate irritation of eyes, skin, and mucous membranes on prolonged contact. Ingestion may cause gastrointestinal irritation.
5.3 **Treatment for Exposure:** INHALATION: remove victim to uncontaminated area; get medical attention if complications arise. INGESTION: get medical attention if complications arise. EYES: flush with large amounts of water for 15 min; get prompt medical attention. SKIN: wash with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade 1. LD_{50}: 12.2 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water, dry powder, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used.**
6.5 **Special Hazards of Combustion Products**
6.6 **Behavior in Fire.** Dust forms explosive mixture in air
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)**
Data not available
8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1. Amoco Chemicals Corp
130 East Randolph Drive
Chicago, Ill. 60601
2. Arco Chemical Co.
260 South Broad St.
Philadelphia, Pa. 19101
3. Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical, 82–99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Inerted
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications.**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 166
13.3 **Boiling Point at 1 atm:** Not pertinent (sublimes)
13.4 **Freezing Point:**
653°F = 345°C = 618°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.54 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent
13.12 **Latent Heat of Vaporization:**
Not pertinent
13.13 **Heat of Combustion:** −8,340 Btu/lb
= −4,630 cal/g = −194 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

IPR

ISOPRENE

Common Synonyms
2-Methyl-1 3-butadiene
beta-Methylbutenyl

Watery liquid | Colorless | Mild odor

Floats on water. Flammable. Irritating vapor is formed.
Boiling point is 93°F

Stop discharge if possible. Keep away from vapors.
Shut off ignition sources and call fire department.
Stay upwind. Flow water spray to knock down vapor.
Avoid contact with liquid and vapor.
Evacuate nonessential personnel.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Containers may explode in fire.
Vapor may explode if ignited in an enclosed area.
Wear self-contained breathing apparatus.
Combat fire from behind barricade or protected location.
Extinguish with dry chemical, CO2, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
Move to fresh air.
If breathing has ceased, apply artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected area with plenty of water.
IN EYES, hold eyelids apart and flush with plenty of water.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** beta-Methylbutenyl
2 Methyl 1, 3 butadiene

3.2 **Coast Guard Compatibility Classification:** Olefin

3.3 **Chemical Formula:**
$CH_2=C(CH_3)CH=CH_2$

3.4 **IMCO/United Nations Numerical Designation:** 3 1/1218

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Vapor proof goggles, self contained breathing apparatus, leather or rubber safety shoes, rubber gloves.

5.2 **Symptoms Following Exposure:** Vapor produces no effects other than slight irritation of the eyes and upper respiratory tract. Liquid may irritate eyes, like gasoline.

5.3 **Treatment for Exposure:** INHALATION: remove victim promptly from irritating or asphyxiating atmosphere; if symptoms of aspiration persist, administer artificial respiration and oxygen; treat symptomatically thereafter; call a physician. EYES: flush with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain it may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.005 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** −65°F C.C.

6.2 **Flammable Limits in Air:** 2% - 9%

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.

6.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated.

6.6 **Behavior in Fire:** May polymerize in containers and explode.

6.7 **Ignition Temperature:** 428°F

6.8 **Electrical Hazard:** Class I, Group C.

6.9 **Burning Rate:** 8.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.

7.2 **Reactivity with Common Materials:** No reaction.

7.3 **Stability During Transport:** Stable.

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization:** Polymerization is accelerated by heat and by oxygen, even by the presence of rusty iron. Iron surfaces should be treated with a suitable reducing agent such as sodium nitrite before they are placed into isoprene service.

7.6 **Inhibitor of Polymerization:** Tertiary butyl catechol (0.06%). Di n butylamine, phenyl beta-naphthyl amine and phenyl alpha naphthylamine are also used. IPR must be inhibited when transported interstate.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 75 ppm/96 hr/fathead minnow/TL m/ fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 B F Goodrich Co
B F Goodrich Chemical Co Division
6100 Oak Tree Blvd
Cleveland, Ohio 44131

2 Goodyear Tire & Rubber Co
Chemical Division
Beaumont, Texas 77704

3 Shell Chemical Co
Petrochemical Division
Houston, Texas 77001

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Research grade 99.99% polymerization grade 99.8%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A T U A W-2

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effects	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 68.12

13.3 **Boiling Point at 1 atm:**
93.4°F = 34.1°C = 307.3°K

13.4 **Freezing Point:**
−230.7°F = −145.9°C = 127.3°K

13.5 **Critical Temperature.**
412°F = 211.1°C = 484.3°K

13.6 **Critical Pressure.**
550 psia = 37.4 atm = 3.79 MN/m

13.7 **Specific Gravity:** 0.681 at 20°C (liquid)

13.8 **Liquid Surface Tension**
19 dynes/cm = 0.0189 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
(est.) 40 dynes/cm = 0.04 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 2.3

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.091

13.12 **Latent Heat of Vaporization:**
150 Btu/lb = 85 cal/g = 3.6 × 10⁵ J/kg

13.13 **Heat of Combustion** −18,486 Btu/lb
= −10,471 cal/g = −438.40 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** −499 Btu/lb
= −277 cal/g = −11.6 × 10⁵ J/kg

(Continued on pages 4 and 5)

NOTES

REVISED 1978

IAC

ISOPROPYL ACETATE

Common Synonyms

Acetic acid isopropyl ester
2-Propyl acetate

Watery liquid Colorless Pleasant fruity odor

Floats and mixes slowly with water. Flammable. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat.

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, give two drinks of water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Evacuate area.
Disperse and flush.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Acetic acid isopropyl ester; 2-Propyl acetate

3.2 **Coast Guard Compatibility Classification** Ester

3.3 **Chemical Formula** $CH_3COOCH(CH_3)_2$

3.4 **IMCO United Nations Numerical Designation** 3.2/1220

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color** Colorless

4.3 **Odor:** Pleasant fruity non-residual

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor/gas mask or air-supplied mask; chemical safety or face splash shield

5.2 **Symptoms Following Exposure** Vapors irritate eyes and respiratory tract; high concentrations can be anesthetic. Liquid irritates eyes; bacteria action may cause irritation; may cause dermatitis. Serious effects if swallowed.

5.3 **Treatment for Exposure:** INHALATION: if victim is overcome by vapors, remove from exposure immediately; call a physician; if breathing is irregular or stopped, start resuscitation and administer oxygen. EYES: flush with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 250 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion** Grade 2: LD$_{50}$ = 5 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Vapors cause slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 37°F (C.C.), 60°F (O.C.)

6.2 **Flammable Limits in Air** 1.8% - 8.0%

6.3 **Fire Extinguishing Agents.** Alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** 860°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 26% 5 days (theor.)

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Eastman Kodak Co.
Tennessee Eastman Co. Division
Kingsport, Tenn. 37662
2. Exxon Chemical Co.
Houston, Texas 77001
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity** 95-99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrested) or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-T-U-V-W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight** 102.13

13.3 **Boiling Point at 1 atm.** 191.3°F = 88.5°C = 361.7°K

13.4 **Freezing Point** −92.7°F = −69.3°C = 203.9°K

13.5 **Critical Temperature.** 500°F = 260°C = 533°K

13.6 **Critical Pressure** 529 psia = 36 atm = 3.65 MN/m

13.7 **Specific Gravity:** 0.874 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** Data not available

13.10 **Vapor (Gas) Specific Gravity:** 3.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.024

13.12 **Latent Heat of Vaporization** 150 Btu/lb = 83 cal/g = 3.5 × 10^5 J/kg

13.13 **Heat of Combustion:** -9420 Btu/lb = -5230 cal/g = -219 × 10^5 J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and A)

NOTES

REVISED 1978

IPA — ISOPROPYL ALCOHOL

Common Synonyms
Isopropanol
2-Propanol
Dimethylcarbinol
sec. Propyl Alcohol
Rubbing alcohol

Waters liquid | Colorless | Unpleasant alcohol odor like rubbing alcohol

Floats and mixes with water. Flammable. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Small: If ignition sources, call fire department.
Stay upwind and use water spray to knock down vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Explosion hazard indoors, outdoors or in sewers.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to eyes.
Harmful if swallowed.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of downstream water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning. High flammability.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
Dimethylcarbinol | 2-Propanol
Isopropanol | sec. Propyl alcohol
Petrohol | Rubbing alcohol

3.2 **Coast Guard Compatibility Classification**
Alcohol

3.3 **Chemical Formula:**
$CH_3CHOHCH_3$

3.4 **IMCO United Nations Numerical Designation:** 3.2/1219

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like ethyl alcohol but somewhat less pungent; characteristic rubbing alcohol odor.

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister mask approved for isopropyl alcohol; goggles or face splash shield.

5.2 **Symptoms Following Exposure.** Vapor causes mild irritation of eyes and upper respiratory tract; high concentrations may be narcotic. Liquid is irritating to eyes and mucous membranes; harmless to skin. Ingested causes drunkenness and vomiting.

5.3 **Treatment for Exposure.** INHALATION: if victim is conscious, he may be given oxygen to breathe from exposure to an approved self-contained breathing apparatus. If breathing is irregular or has stopped, artificial respiration should be administered by trained personnel, preferably with oxygen. EYES: Flush with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 400 ppm

5.5 **Short-Term Inhalation Limits:** 400 ppm for 10 min

5.6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$: 5.0 to 16 g/kg (oral rat) LD$_{50}$: 3.6 to 6.4 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically no effect on the skin.

5.10 **Odor Threshold:** 90 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point:** 60°F (O.C.) 53°F (C.C.)

6.2 **Flammable Limits in Air**
2.5% - 12.7%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used**
Water may be ineffective.

6.5 **Special Hazards of Combustion Products.**
Not pertinent.

6.6 **Behavior in Fire:** Not pertinent.

6.7 **Ignition Temperature:** 750°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 2.0 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.**
9600-11,000 ppm/24 hr/shiner/Texas/fresh water

8.2 **Waterfowl Toxicity:**
Data not available

8.3 **Biological Oxygen Demand (BOD)**
1.19, 5 days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. ARCO Chemical Co.
260 South Broad St.
Philadelphia, PA 19101

2. Shell Chemicals, Inc.
Industrial Chemical Division
Houston, Tex. 77001

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 91%, 99%
Anhydrous

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame, pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

APQRS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Exposure	1
Liquid or Solid Irritation	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 60.10

13.3 **Boiling Point at 1 atm.**
180.1°F = 82.3°C = 355.5°K

13.4 **Freezing Point**
-127.3°F = -88.5°C = 184.7°K

13.5 **Critical Temperature**
455.4°F = 235.2°C = 508.4°K

13.6 **Critical Pressure**
691 psia = 47 atm = 4.76 MN/m²

13.7 **Specific Gravity:** 0.785 at 20°C (liquid)

13.8 **Liquid Surface Tension:** N.A.

13.9 **Liquid-Water Interfacial Tension.**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.1

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.08

13.12 **Latent Heat of Vaporization**
287 Btu/lb = 39.8 cal/g = 1.67 kJ/g

13.13 **Heat of Combustion:** -13,900 Btu/lb
= -7731 cal/g = -32.40 kJ/g

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Completely miscible
= 19.1 cal/g = 79.9 kJ/g

13.16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

IPP	# ISOPROPYLAMINE

Common Synonyms
2-Aminopropane
Monoisopropylamine

Liquid Colorless Strong ammonia odor

Floats and mixes with water
Flammable irritating vapor is produced
Boiling point is 91°F

Stop discharge if possible Keep people away
Shut off ignition sources call fire department
Stay upwind Use water spray to knock down vapor
Avoid contact with liquid and vapor
Isolate area until gas has dispersed
Notify local health and pollution control agencies

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Wear goggles and self-contained breathing apparatus
Extinguish with dry chemicals, CO2, water spray or alcohol foam
Water may be ineffective
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing, difficult breathing or loss of consciousness

For eyes: Hold eyelids apart and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Will burn skin and eyes
If swallowed will cause nausea

Remove contaminated clothing
Flush affected areas with plenty of water
IF IN EYES: Hold eyelids apart and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, give large quantities of water
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS
Do not induce vomiting
Do not give anything by mouth

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning: high flammability
Turn off all pilot lights
Keep unnecessary people away
Ventilate area
Evacuate area
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** 2-Aminopropane; Monoisopropylamine; 2-Propylamine
3.2 **Coast Guard Compatibility Classification.** Data not available
3.3 **Chemical Formula** $(CH_3)_2CHNH_2$
3.4 **IMCO/United Nations Numerical Designation** UN 1221

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color** Colorless
4.3 **Odor** Strong ammoniacal pungent; resembling typical amine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Self-contained breathing apparatus; butyl rubber gloves and apron; chemical face shield or vapor goggles
5.2 **Symptoms Following Exposure** Inhalation causes nose and throat irritation, severe coughing and chest pain due to irritation of air passages, can cause lung edema and loss of consciousness. Ingestion causes nausea, salivation and severe irritation of mouth and stomach. Contact with eyes causes severe irritation and possible edema of the cornea. Contact with skin causes severe irritation.
5.3 **Treatment for Exposure:** INHALATION remove victim to fresh air; if he is not breathing give artificial respiration; if breathing is difficult give oxygen; call a physician. INGESTION call a physician immediately; encourage the drinking of large quantities of water followed by dilute vinegar (lemon juice, cider or other weak acids); keep patient warm. EYES flush with water for 15 minutes holding eyelids apart; call physician as soon as possible, preferably an eye specialist. SKIN flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** [illegible] rated TLD, [illegible] dosage used
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating, such that personnel will not usually tolerate moderate or high concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure
5.10 **Odor Threshold** 5 ppm

6 FIRE HAZARDS

6.1 **Flash Point** −15°F OC
6.2 **Flammable Limits in Air** 2.0% - 12%
6.3 **Fire Extinguishing Agents** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire
6.6 **Behavior in Fire** Burning isopropylamine is difficult to control because of the ease of ignition of the vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Containers may explode.
6.7 **Ignition Temperature** 756°F
6.8 **Electrical Hazard.** Data not available
6.9 **Burning Rate** 0.33 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials**
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 30 - 89 ppm/24 hr/creek chub/critical range/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc.
U.S. Highway 30
Pace, Fla. 32502
2. Pennwalt Corporation
Three Parkway
Philadelphia, Pa. 19102
3. Virginia Chemicals, Inc.
3340 W. Norfolk Rd.
Portsmouth, Va. 23703

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 99.0%
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

VPQRS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight.** 59.11
13.3 **Boiling Point at 1 atm:** 90.3°F = 32.4°C = 305.6°K
13.4 **Freezing Point** −139°F = −95°C = 178°K
13.5 **Critical Temperature:** 396°F = 202°C = 475°K
13.6 **Critical Pressure:** 740 psia = 50 atm = 5.1 MN/m²
13.7 **Specific Gravity** (ref. to H2O at 20°C) (liquid)
13.8 **Liquid Surface Tension.** 16.8 dynes/cm = 0.0168 N/m at 70°F
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.04
13.11 **Ratio of Specific Heats of Vapor (Gas):**
13.12 **Latent Heat of Vaporization** 193 Btu/lb = 10⁴ cal/g = 4.45 × 10⁴ J/kg
13.13 **Heat of Combustion:** −16,940 Btu/lb = −9,420 cal/g = −394 × 10⁴ J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** [illegible] cal/g [illegible] J/kg
13.16 **Heat of Polymerization.** Not pertinent

(See next page)

NOTES

IPE — ISOPROPYL ETHER

Common Synonyms

Diisopropyl ether
Diisopropyl oxide
2 Isopropoxypropane

Liquid | Colorless | Sweet odor

Floats and mixes slowly with water Flammable irritating vapor is produced

Shut off ignition sources Call fire department
Stop discharge if possible Keep people away
Stay upwind Use water spray to "knock down" vapor
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemicals alcohol foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

Call for medical aid

VAPOR
Irritating to eyes nose and throat
If inhaled will cause headache dizziness or nausea
Move victim to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES Hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk

Water Pollution

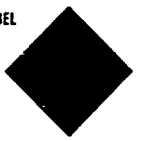
Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diisopropyl ether
Diisopropyl oxide
2 Isopropoxypropane

3 2 **Coast Guard Compatibility Classification.** Ethers (21)

3 3 **Chemical Formula:** $(CH_3)_2CHOCH(CH_3)_2$

3 4 **IMCO/United Nations Numerical Designation:** 33 1159

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Sweet slightly sharp characteristic pungent ethereal, like camphor and ethyl ether

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air pack or organic canister mask rubber gloves goggles

5 2 **Symptoms Following Exposure:** Inhalation causes anesthesia nausea headache dizziness and irritation of the eyes and nose Contact of liquid with eyes causes only minor injury repeated contact with skin will remove natural oils and may cause dermatitis

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air and obtain medical attention immediately keep him warm and at rest and give artificial respiration if breathing stops maintain an open airway EYES flush with water for 15 min SKIN flush with water INGESTION do NOT induce vomiting get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 250 ppm (tentative)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 oral LD_{50} 8470 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** −18°F O C −18°F C C

6 2 **Flammable Limits in Air** 1 4% 7 9%

6 3 **Fire Extinguishing Agents** Dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back Containers may explode when heated

6 7 **Ignition Temperature:** 830°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate** 4 0 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport:** Unstable peroxides may form on long standing in contact with air these may explode spontaneously or when heated

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Shell Chemical Company
Industrial Chemicals Division
P O Box 2463
Houston Texas 77001

2 Exxon Chemical Company
P O Box 2180
Houston Texas 77001

3 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 94+% May contain 0 01% hydroquinone or other inhibitor to prevent peroxide formation

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q T U V-W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 102 2

13 3 **Boiling Point at 1 atm.** 156°F = 69 C = 342°K

13 4 **Freezing Point:** −123°F = −86°C = 187 K

13 5 **Critical Temperature:** 440 4°F = 226 9°C = 500 1 K

13 6 **Critical Pressure:** 418 psia = 28 4 atm = 2 88 MN/m

13 7 **Specific Gravity:** 0 724 at 20°C (liquid)

13 8 **Liquid Surface Tension** 17 1 dynes/cm = 0 017 1 N/m at 25 C

13 9 **Liquid-Water Interfacial Tension:** 7 1 dynes/cm = 0 017 1 N/m at 25 C

13 10 **Vapor (Gas) Specific Gravity** 3 5

13 11 **Ratio of Specific Heats of Vapor (Gas).** 1 0590

13 12 **Latent Heat of Vaporization** 131 Btu/lb = 73 cal/g = 3 x 10 J/kg

13 13 **Heat of Combustion:** 17 440 Btu/lb = 9 390 cal/g = 393 x 10 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and A

NOTES

IPM — ISOPROPYL MERCAPTAN

Common Synonyms
2 Propanethiol
Propane-2 thiol

Liquid | White | Strong Skunk Odor

Floats and mixes with water. Flammable, irritating vapor is produced

Shut off leak if it can be done without risk
Stop discharge if possible. Keep people away
Avoid contact with liquid and vapor
Stay upwind. Keep out of low areas. Ventilate closed spaces before entering
Isolate and remove discarded material
Notify local health and pollution control agencies

Fire

FLAMMABLE.
Irritating gases may be produced when heated
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Water may be ineffective to fight fire
Cool exposed containers with water

Exposure

AVOID CONTACT AND INHALATION

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing, or loss of consciousness
Poisonous gas produced when mixed with large amounts of water
Positive pressure breathing apparatus may be necessary
Remove victim to fresh air

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove victim to fresh air. Physical Injury
Evacuate for at least 1/2 mile in all directions if spill is in water
IN EYES: Flush with plenty of water for at least 15 minutes. Get medical attention
IF SWALLOWED and victim is CONSCIOUS, dilute with large amounts of water or milk and induce vomiting
IF SWALLOWED and victim is NOT CONSCIOUS OR HAVING CONVULSIONS: Do not induce vomiting. Do not give anything by mouth

Water Pollution

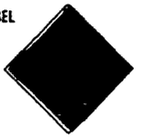
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify owners of public water supplies

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-6)

Issue warning: high flammability, air contaminant, water contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 2 Propanethiol; Propane 2 thiol
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $(CH_3)_2CHSH$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Powerful skunk

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation causes loss of sense of smell, muscular weakness, convulsions, respiratory paralysis. Ingestion causes nausea and vomiting. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, start artificial respiration and give oxygen if required, observe for signs of pulmonary edema, get medical attention. INGESTION: give large amount of water and induce vomiting. EYES or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1 7 mg/kg rats
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** 0 25 ppb

6 FIRE HAZARDS

6 1 **Flash Point:** −40°F O C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Irritating sulfur dioxide gas is formed in fire
6 6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** No pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pennwalt Corporation
Three Parkway
Philadelphia, Pa 19102

2 Phillips Petroleum Co
Special Products Div
Chemical Dept
Bartlesville, Okla 74004

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee, Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 98 0+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

APQRS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 76 2
13 3 **Boiling Point at 1 atm:** 126 6°F = 52 5°C = 325 8°K
13 4 **Freezing Point:** −202 8°F = −130 5°C = 142 7°K
13 5 **Critical Temperature:** Data not available
13 6 **Critical Pressure:** Data not available
13 7 **Specific Gravity:** 0 814 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 22 0 dynes/cm = 0 022 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 2 6
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 0964 at 15 6°C
13 12 **Latent Heat of Vaporization:** 165 7 Btu/lb = 92 1 cal/g = 3 83 × 10⁵ J/kg
13 13 **Heat of Combustion:** 4 920 Btu/lb = 8 290 cal/g = 34 7 × 10⁶ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

IPC	# ISOPROPYL PERCARBONATE

Common Synonyms	
Peroxydicarbonic acid diisopropyl ester Diisopropyl percarbonate Diisopropyl peroxydicarbonate Isopropyl peroxydicarbonate Peroxydicarbonic acid bis(1-methylethyl) ester	Solid (Packed in Dry Ice) White Sharp Unpleasant Odor Sinks in water Freezing point is 45°F

Stop discharge if possible. Keep people away.
Shut off ignition sources. Call fire department.
Avoid contact with solid and vapor.
Isolate area from the immediate hazard area.
Notify local health and pollution control agencies.

Fire

COMBUSTIBLE
May cause fire on contact with combustibles
Will increase the intensity of a fire
Containers may explode in fire

DO NOT USE DRY CHEMICAL OR CARBON DIOXIDE ON FIRE.
Flood fire area with water from a protected location.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

Remove to fresh air.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes
Harmful if swallowed

Remove contaminated clothing.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED, do NOT induce vomiting.
IF SWALLOWED, do NOT induce vomiting. GIVE LARGE QUANTITIES OF WATER. CALL A PHYSICIAN IMMEDIATELY.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

No information is available on the effect of this material on marine life.
No information is available on the biological oxygen demand (BOD) and the chemical oxygen demand (COD).

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Isolate hazard area. Keep unauthorized personnel away.
Keep combustible material away.
Remove sources of ignition.
Should be removed.
Chemical and physical treatment.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Diisopropyl percarbonate
Diisopropyl peroxydicarbonate
Isopropyl peroxydicarbonate, Peroxydicarbonic acid bis(1-methylethyl) ester
Peroxydicarbonic acid diisopropyl ester

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula** $C_8H_{14}O_6$ OR $C_8H_{14}O_6$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid (contents packed in Dry Ice)

4.2 **Color:** White

4.3 **Odor:** Disagreeable ester

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Rubber gloves and chemical goggles. Rubber aprons and rubber or plastic aprons. Respirator (independent of other wearing).

5.2 **Symptoms Following Exposure:** Inhalation of concentrations of particles but prolonged exposure may cause pulmonary edema. Contact with eyes may cause severe irritation. Solution may cause severe irritation.

5.3 **Treatment for Exposure.** INHALATION: If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with plenty of water. SKIN: Wash with plenty of water. INGESTION: Induce vomiting as directed by medical personnel.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 Poison. Oral rat LD50: 1,000 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air.** Not pertinent

6.3 **Fire Extinguishing Agents.** Water

6.4 **Fire Extinguishing Agents Not to be Used.** All extinguishing agents may be ineffective

6.5 **Special Hazards of Combustion Products.** Flammable and toxic gases in fire. Gases may include acetone, isopropyl alcohol, acetaldehyde and ethane.

6.6 **Behavior in Fire.** Explosive vapor/air mixtures may be generated. Decomposition may lead to self-ignition. Container may explode in fire. Decomposition is very difficult to stop. Water in large quantities may be needed.

6.7 **Ignition Temperature.** Data not available

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May decompose with formation of oxygen when in contact with metals

7.3 **Stability During Transport:** Unstable above 0°F with formation of oxygen gas

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. PPG Industries, Inc.
Chemical Division
One Gateway Center
Pittsburgh, PA 15222

2. Pennwalt Corp., Lucidol Div.
1740 Military Road
Buffalo, NY 14240

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 98%

10.2 **Storage Temperature.** Below -15°C (5°F)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

H

12 HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations.** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

*13.2 **Molecular Weight:** 206.2

13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13.4 **Freezing Point:** Not available (Critical Temperature)

*13.5 **Critical Temperature:** Not pertinent

*13.6 **Critical Pressure:** Not pertinent

*13.7 **Specific Gravity:** Not available

*13.8 **Liquid Surface Tension.** Not pertinent

*13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity.** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

*13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion.** -4,500 Btu/lb = -4,500 cal/g = -188.3 kJ/g

13.14 **Heat of Decomposition.** -470 Btu/lb = -261 cal/g = -10.9 kJ/g

*13.15 **Heat of Solution.** Not pertinent

*13.16 **Heat of Polymerization:** Not pertinent

Heat of vaporization

NOTES

IVA

ISOVALERALDEHYDE

Common Synonyms

3-Methylbutyraldehyde
Isovaleric aldehyde
Isovalral
3-Methylbutanal

Liquid Colorless Weak suffocating odor

Floats on water Flammable Irritating vapors is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, nausea, vomiting or difficult breathing

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floats on shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

Synonyms
Coast Guard Compatibility Classification
Chemical Formula $C_5H_{10}O$
IMCO/United Nations Numerical Designation

4 OBSERVABLE CHARACTERISTICS

4 Physical State (as shipped) Liquid
4 Color Colorless
4 Odor Weak suffocating odor

5 HEALTH HAZARDS

Personal Protective Equipment
Symptoms Following Exposure
Treatment for Exposure
Toxicity by Inhalation (Threshold Limit Value)
Short Term Inhalation Limits
Toxicity by Ingestion
Late Toxicity
Vapor (Gas) Irritant Characteristics
Liquid or Solid Irritant Characteristics
Odor Threshold

6 FIRE HAZARDS

Flash Point Below 0°F OC
Flammable Limits in Air Data not available
Fire Extinguishing Agents Dry chemical, foam, carbon dioxide
Fire Extinguishing Agents Not to be Used Water or water solutions
Special Hazards of Combustion Products None known
Behavior in Fire None known
Ignition Temperature Data not available
Electrical Hazard Data not available
Burning Rate Moderate

7 CHEMICAL REACTIVITY

Reactivity with Water No reaction
Reactivity with Common Materials No reaction
Stability During Transport Stable
Neutralizing Agents for Acids and Caustics None known
Polymerization None known
Inhibitor of Polymerization None known

8 WATER POLLUTION

Aquatic Toxicity Data not available
Waterfowl Toxicity Data not available
Biological Oxygen Demand (BOD) Data not available
Food Chain Concentration Potential None

9. SELECTED MANUFACTURERS

Aldrich Chemical Co., Inc.
940 West St. Paul Avenue
Milwaukee, Wisconsin 53233

Eastman Chemical Division
Kingsport, Tennessee

Pfaltz and Bauer, Inc.
Flushing, New York

10 SHIPPING INFORMATION

Grades of Purity Commercial
Storage Temperature Ambient
Inert Atmosphere No requirement
Venting Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

VTLAW

12 HAZARD CLASSIFICATIONS

Code of Federal Regulations Flammable liquid
NAS Hazard Rating for Bulk Water Transportation Not listed
NFPA Hazard Classifications Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

Physical State at 15°C and 1 atm Liquid
Molecular Weight 86
Boiling Point at 1 atm. 90.1°F (305.1°K)
Freezing Point -129.8°F (-129.8°K)
Critical Temperature None known
Critical Pressure None known
Specific Gravity 0.8 at 20°C
Liquid Surface Tension
Liquid-Water Interfacial Tension None known
Vapor (Gas) Specific Gravity
Ratio of Specific Heats of Vapor (Gas)
Latent Heat of Vaporization
Heat of Combustion
Heat of Decomposition None known
Heat of Solution None known
Heat of Polymerization None known

Vapor Density

NOTES

JPO	# JET FUELS: JP-1

Common Synonyms
Kerosene
Range oil
Fuel Oil No. 1

Water Insol — Colorless — Fuel oil odor

Floats on water

S.G. discharge if possible
Call fire department
Avoid spreading liquid
Evacuate and remove to safe area
Notify supervisor and Police Department

Fire

Combustible

Extinguish with foam, dry chemical or carbon dioxide
Water may be ineffective
Cool exposed surfaces

Exposure

ALL FORMS OF MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Avoid contact with liquid and vapor
Keep upwind and use with adequate ventilation
IF IN EYES: Flush with plenty of water for at least 15 minutes
IF SWALLOWED: DO NOT induce vomiting
Get medical attention
DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
Floating to shoreline
May be dangerous if enters water intakes

Notify supervisor and Police Department
Notify supervisor and Police Department

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-1

Shut off source if possible
Notify supervisor and Police Department
Evacuate area

2 LABELS

No label required
For DOT Regulations

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Kerosene
K-1
Range Oil
Fuel Oil No. 1

3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures

3.3 Chemical Formula: C_nH_{2n}

3.4 IMCO United Nations Numerical Designation: None

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid

4.2 Color: Colorless to pale straw

4.3 Odor: Kerosene

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Rubber gloves, goggles, boots, apron

5.2 Symptoms Following Exposure: Vapor irritating to eyes, nose, throat. Liquid irritating to skin and eyes. Harmful if swallowed.

5.3 Treatment for Exposure: INHALATION: Move to fresh air. INGESTION: Do not induce vomiting. Get medical attention. EYES: Flush with water. SKIN: Wash with soap and water.

5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm

5.5 Short-Term Inhalation Limits: 2500 mg·m^3 for 60 min

5.6 Toxicity by Ingestion: Moderately Toxic

5.7 Late Toxicity: Data not available

5.8 Vapor (Gas) Irritant Characteristics: Vapor irritating to eyes, nose, throat

5.9 Liquid or Solid Irritant Characteristics: Liquid irritating to skin and eyes

5.10 Odor Threshold: 100 ppm

6 FIRE HAZARDS

6.1 Flash Point: 100°F (38°C)

6.2 Flammable Limits in Air: 0.7% - 5.0%

6.3 Fire Extinguishing Agents: Foam, dry chemical or carbon dioxide

6.4 Fire Extinguishing Agents Not to be Used: Not pertinent

6.5 Special Hazards of Combustion Products: Not pertinent

6.6 Behavior in Fire: Not pertinent

6.7 Ignition Temperature: 444°F

6.8 Electrical Hazard: Not pertinent

6.9 Burning Rate: 3.5 mm/min

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction

7.2 Reactivity with Common Materials: No reaction

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: 2500 ppm/24 hr/50% TL$_m$/Fresh water

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): 0.42 lb/lb 5 days

8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Exxon Co
60 Rockefeller Plaza
New York, N.Y. 10020

Shell Oil Co
One Shell Plaza
Houston, Texas 77002

Sun Oil Co
230 Radnor Rd
Newtown Square, Pa. 19073

10 SHIPPING INFORMATION

10.1 Grades of Purity: Technical

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: No requirement

10.4 Venting: Open or pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

ATI

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combustible liquid

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Health	1
Hazards	
Vapor Toxicity	1
Liquid or Solid Toxicity	1
Flammability	1
Reactivity	0
Water	0
Spoilage	1

12.3 *EPA Hazard Classifications:

Category	Classification
Health Hazard (Acute)	1
Flammability	1
Reactivity (Pressure)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid

13.2 Molecular Weight: 150-210

13.3 Boiling Point at 1 atm: 304°F (151°C)

13.4 Freezing Point: -40°F (-40°C)

13.5 Critical Temperature: Not pertinent

13.6 Critical Pressure: Not pertinent

13.7 Specific Gravity: 0.775-0.830 @ 60°F

13.8 Liquid Surface Tension: Not pertinent

13.9 Liquid-Water Interfacial Tension: Not pertinent

13.10 Vapor (Gas) Specific Gravity: Not pertinent

13.11 Ratio of Specific Heats of Vapor (Gas): 1.05

13.12 Latent Heat of Vaporization: 110 Btu/lb

13.13 Heat of Combustion: -18,500 Btu/lb

13.14 Heat of Decomposition: Not pertinent

13.15 Heat of Solution: Not pertinent

13.16 Heat of Polymerization: Not pertinent

NOTES

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JPT	JET FUELS: JP-3

Common Synonyms	Waters liquid Colorless Fuel oil odor Floats on water. Irritating combustible vapor may be produced.
Fire	Combustible
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled, will cause coughing, dizziness, headache or difficult breathing LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
3 2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** C_nH_{2n}
3 4 **IMCO United Nations Numerical Designation:**

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)**
4 2 **Color:**
4 3 **Odor:**

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:**
5 2 **Symptoms Following Exposure:**
5 3 **Treatment for Exposure:** ASPIRATION ... INGESTION ... EYES ... SKIN ...
5 4 **Toxicity by Inhalation (Threshold Limit Value)**
5 5 **Short-Term Inhalation Limits.** 2500 mg m^3 for 60 min
5 6 **Toxicity by Ingestion.**
5 7 **Lethal Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.**
5 9 **Liquid or Solid Irritant Characteristics.** Moderate hazard.
5 10 **Odor Threshold**

6 FIRE HAZARDS

6 1 **Flash Point:**
6 2 **Flammable Limits in Air.** Data not available
6 3 **Fire Extinguishing Agents.** ... dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used**
6 5 **Special Hazards of Combustion Products.**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard**
6 9 **Burning Rate**

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:**
7 2 **Reactivity with Common Materials**
7 3 **Stability During Transport**
7 4 **Neutralizing Agents for Acids and Caustics:**
7 5 **Polymerization:**
7 6 **Inhibitor of Polymerization.**

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)**
8 4 **Food Chain Concentration Potential**

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

*10 1 **Grades of Purity:**
10 2 **Storage Temperature:**
10 3 **Inert Atmosphere:**
10 4 **Venting:**

11 HAZARD ASSESSMENT CODE

NFI

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	
Health	
Vapor Toxicity	
Liquid or Solid Toxicity	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Acute Toxicity	
Reactivity	
Other Chemicals	
Water	
Self Reaction	

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

*13 1 **Physical State at 15°C and 1 atm**
*13 2 **Molecular Weight**
*13 3 **Boiling Point at 1 atm:**
*13 4 **Freezing Point:**
*13 5 **Critical Temperature**
*13 6 **Critical Pressure:**
*13 7 **Specific Gravity**
*13 8 **Liquid Surface Tension:** Data not available
*13 9 **Liquid-Water Interfacial Tension.** Data not available
13 10 **Vapor (Gas) Specific Gravity:**
13 11 **Ratio of Specific Heats of Vapor (Gas)**
*13 12 **Latent Heat of Vaporization:**
*13 13 **Heat of Combustion.**
*13 14 **Heat of Decomposition:**
*13 15 **Heat of Solution**
*13 16 **Heat of Polymerization.**

NOTES

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JPF — JET FUELS: JP-4

Common Synonyms

Water: liquid | Color: colorless | Fuel oil odor

Floats on water

Fire

FLAMMABLE

Exposure

CAUSE OF SOME SKIN AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed

IN EYES: Immediately flush with plenty of water
IF SWALLOWED and CONSCIOUS: Induce vomiting
DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
Floating to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment of Exposure: INGESTION:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits: 2900 mg/m³ for 60 min
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Health Hazard	
Vapor	
Liquid Noxiousness	
Fire	
Reactivity	
Mixing Rule	
Special Hazard	
Water	
Soluble Fire	

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard	
Flammability	
Reactivity	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

REVISED 1978

JPV	JET FUELS: JP-5

Common Synonyms

Liquid | Colorless | Fuel-like odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
Floating to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula: Not pertinent
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INSPIRATION
INGESTION: DO NOT
SKIN
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits: 250 mg/m³ for 60 min
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents
6.4 Fire Extinguishing Agents Not to be Used.
6.5 Special Hazards of Combustion Products.
6.6 Behavior in Fire
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization.
7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.
Chemical Name: Liquid

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Health	
Flammability	
Reactivity	
Water Pollution	
Human Toxicity	

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard	
Flammability	
Reactivity	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization.
13.13 Heat of Combustion.
13.14 Heat of Decomposition:
13.15 Heat of Solution.
13.16 Heat of Polymerization.

NOTES

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KRS	KEROSENE

Illuminating oil
Kerosene
range oil
Fuel oil No. 1
Jet Fuel JP-1

Waters Equiv. Colorless Fuel oil odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
Floating to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:

3.2 Coast Guard Compatibility Classification.
Miscellaneous hydrocarbon mixtures

3.3 Chemical Formula:

3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):

4.2 Color:

4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment.

5.2 Symptoms Following Exposure:

5.3 Treatment for Exposure INSPIRATION
INGESTION
SKIN

5.4 Toxicity by Inhalation (Threshold Limit Value):

5.5 Short-Term Inhalation Limits. 2500 mg/m³ for 60 min

5.6 Toxicity by Ingestion.

5.7 Late Toxicity:

5.8 Vapor (Gas) Irritant Characteristics.

5.9 Liquid or Solid Irritant Characteristics.

5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:

6.2 Flammable Limits in Air

6.3 Fire Extinguishing Agents:

6.4 Fire Extinguishing Agents Not to be Used:

6.5 Special Hazards of Combustion Products.

6.6 Behavior in Fire:

6.7 Ignition Temperature:

6.8 Electrical Hazard:

6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:

7.2 Reactivity with Common Materials:

7.3 Stability During Transport:

7.4 Neutralizing Agents for Acids and Caustics.

7.5 Polymerization:

7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity

8.2 Waterfowl Toxicity

8.3 Biological Oxygen Demand (BOD)

8.4 Food Chain Concentration Potential:
None

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:

10.2 Storage Temperature:

10.3 Inert Atmosphere:

10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating

12.3 NFPA Hazard Classifications:

Category	Classification

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm:

*13.2 Molecular Weight:

*13.3 Boiling Point at 1 atm:

*13.4 Freezing Point:

*13.5 Critical Temperature:

*13.6 Critical Pressure:

*13.7 Specific Gravity:

*13.8 Liquid Surface Tension:

*13.9 Liquid-Water Interfacial Tension:

13.10 Vapor (Gas) Specific Gravity

13.11 Ratio of Specific Heats of Vapor (Gas)

*13.12 Latent Heat of Vaporization.

13.13 Heat of Combustion:

13.14 Heat of Decomposition.

*13.15 Heat of Solution:

*13.16 Heat of Polymerization:

NOTES

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LTA LACTIC ACID

Common Synonyms
2-Hydroxypropanoic acid
Racemic lactic acid
Milk acid
Alpha Hydroxypropionic acid

Thick Liquid Colorless to Yellow Weak Unpleasant Odor

Sinks and Mixes with water

Avoid contact with liquid and vapor
Stop discharge if possible
Isolate and remove discharge if spilled
Notify local health and pollution control agencies

Fire

Combustible

Extinguish with water fog, chemicals, carbon dioxide

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If in eyes hold lids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen
LIQUID
Will burn skin and eyes
If swallowed will cause nausea
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold lids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Coast Guard Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2-Hydroxypropanoic acid, alpha Hydroxypropionic acid, Milk acid, Racemic lactic acid

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula** $CH_3CHOHCOOH \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Syrupy liquid

4 2 **Color** Yellow to colorless

4 3 **Odor:** None or weak acidic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, goggles, self contained breathing apparatus where high concentrations of mist are present

5 2 **Symptoms Following Exposure:** Inhalation of mist causes coughing and irritation of mucous membranes. Ingestion even of diluted preparations has corrosive effect on the esophagus and stomach. Contact with concentrated solutions can cause severe burns of skin or eye

5 3 **Treatment for Exposure** INHALATION move to fresh air. INGESTION give large amounts water. EYES flush with water for at least 15 min. SKIN flush with water, wash well with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade Oral LD_{50} 1.810 mg/kg (mice, rats)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** 4.0×10^{-2} ppm

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent (not flammable or burns with difficulty)

6 2 **Flammable Limits in Air.** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Slowly corrodes most metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Dilute with water, rinse with sodium bicarbonate or lime solution

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
>30 ppm/>100 hr/goldfish/no effect, fresh water
694 ppm/6 hr/mosquito fish, killed, fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):**
72% 5 days

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Clinton Corn Processing Co
P O Box 348
Clinton, Iowa 52732

2 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 394
Jersey City, N J 07304

3 Monsanto Company
800 North Lindbergh Blvd
St Louis, Mo 63166

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** USP Reagent
Technical 88% Food processing 50% 80% The balance is water in all cases

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classification**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15.5°C and 1 atm.**
Liquid

13 2 **Molecular Weight** 90

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.20 at 20° (Liquid)

13 8 **Liquid Surface Tension:**
Data not available

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion** −6 520 Btu/lb = −3 620 cal/g = −152 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

.LS

LATEX, LIQUID SYNTHETIC

Common Synonyms
Plastic latex
Synthetic rubber latex

Liquid White

Mixes with water

[illegible] if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Combustible solid is produced when heated

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to eyes
IF IN EYES Hold eyelids open and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of canal water systems

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Disperse and flush if not coagulated
Should be removed if coagulated
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Plastic latex
Synthetic rubber latex

3 2 **Coast Guard Compatibility Classification**
Miscellaneous water solutions

3 3 **Chemical Formula:** Not pertinent

3 4 **IMCO-United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Milky

4 3 **Odor:** Each type has a characteristic odor

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Chemical goggles or face shield

5 2 **Symptoms Following Exposure:** Irritation of eyes

5 3 **Treatment for Exposure:** Flush eyes with water for at least 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** None

5 9 **Liquid or Solid Irritant Characteristics:** Contact with eyes may cause irritation

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable unless coagulated

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** If the latex dries out and then burns hydrochloric acid hydrogen cyanide and benzene gases may be evolved All are irritating and poisonous

6 6 **Behavior in Fire:** Heat may coagulate the latex and form sticky plastic lumps which may burn

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Coagulated by heat and acids to gummy flammable material

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Low class

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Borg Warner Corp
Marbon Division
Washington W Va 26161

2 W R Grace & Co
Dewey and Almy Chemical Division
Cambridge Mass 02140

Rohm and Haas Co
Independence Mall West
Philadelphia Pa 19105

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** All commercial latexes are shipped in a variety of concentrations in water depending on the particular polymer involved and the intended use of the latex None are particularly hazardous except that they will coagulate to gummy flammable material

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-1

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not Listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm** Variable

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 1 057 at 25°C (liquid)
(liquid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

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LPO — LAUROYL PEROXIDE

Common Synonyms

Dilauroyl peroxide
Dodecanoyl peroxide

Solid — White — Faint soapy odor

Floats on water

Call fire department
Keep people away
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
May cause fire on contact with combustibles
Containers may explode in fire
May explode if exposed to heat or flames

Control fires from behind barrier
Flood discharge area with water
Cool exposed containers with water

Exposure

Call for medical aid

SOLID

Irritating to skin and eyes.
Harmful if swallowed

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk — do not have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not pour anything into victim's mouth; keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — oxidizing material
water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dilauroyl peroxide
Dodecanoyl peroxide

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula** $[CH_3(CH_2)_{10}COO]_2$

3 4 **IMCO/United Nations Numerical Designation:** NZ 1430

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** White

4 3 **Odor:** Faint pungent, bland soapy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves, goggles

5 2 **Symptoms Following Exposure:** Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach

5 3 **Treatment for Exposure:** EYES wash with plenty of water for 15 min. and get medical attention. SKIN wash with plenty of soap and water. INGESTION administer inert emetic to induce vomiting and call a physician

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Weak carcinogen in mice

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 **Flash Point:** Not pertinent
(oxidizing combustible solid)

6 2 **Flammable Limits In Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, dry chemical, foam, or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Can increase the severity of a fire. Becomes sensitive to shock when hot. Containers may explode in fire. May ignite or explode spontaneously if mixed with flammable materials

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May ignite or explode spontaneously when mixed with combustible materials

7 3 **Stability During Transport:** Stable if not overheated

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Pennwalt Corporation
Luzidol Division
1740 Military Road
Buffalo, N.Y. 14240

2 Witco Chemical Corporation
U.S. Peroxygen Division
850 Morton Avenue
Richmond, Calif. 94804

3 Argus Chemicals Division
Dart Industries, Inc.
585 Garden Street
Elyria, Ohio 44035

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 97–98% dry or wetted with water

10 2 **Storage Temperature:** <80°F

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

H/

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Organic Peroxide

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	3
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 399

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** 129.8°F = 54.4°C = 327.5°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 0.91 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) −16 500 Btu/lb = −9 100 cal/g = −340 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Data not available

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 1 and 5

NOTES

LRM — LAURYL MERCAPTAN

Common Synonyms
1-Dodecanethiol
Dodecyl mercaptan

Oily liquid | Colorless | Mild skunk odor

Floats on water. Freezing point is 19°F

Fire

Combusti
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID
LIQUID OR SOLID
Irritating to skin and eyes
If swallowed, will cause nausea

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Dodecanethiol
Dodecyl mercaptan

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:** $CH_3(CH_2)_{11}SH$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color** Colorless

4.3 **Odor.** Mild skunk

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Respirator when mist is present, rubber or vinyl gloves, chemical goggles, rubber shoes and apron

5.2 **Symptoms Following Exposure:** Liquid is irritating to skin, eyes and mucous membranes. Ingestion may cause nausea. Repeated exposure may cause dermatitis and may produce a sensitizing effect

5.3 **Treatment for Exposure.** Get medical attention for all eye exposures and all other serious exposures. INHALATION (mist): rinse mouth, respirate with cold water, treatment is symptomatic. INGESTION: dilute by drinking water, if vomiting occurs, drink more water, do not induce vomiting. EYES: flush thoroughly with water, ventilation by electric fan is helpful in removing last traces, especially around eyes and eyelids. SKIN: remove contaminated clothing, flush skin with water, wash exposed area with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Causes decline in kidney and liver function in rats

5.8 **Vapor (Gas) Irritant Characteristics.** Irritating concentration of vapor unlikely, but mist can cause irritation of eyes and upper respiratory tract

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** 4 mg/m^3

6. FIRE HAZARDS

6.1 **Flash Point** 262°F O.C.

6.2 **Flammable Limits in Air**
Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used**
Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products.**
Poisonous and irritating gases (e.g. sulfur dioxide) are generated in fires

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available

8.2 **Waterfowl Toxicity:**
Data not available

8.3 **Biological Oxygen Demand (BOD):**
Data not available

8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Occidental Petroleum Corp
Hooker Chemical Corp
Stamford, Conn. 06905

2 Phillips Petroleum Co
Bartlesville, Okla. 74004

3 Uniroyal Inc.
Uniroyal Chemical Co. Division
Naugatuck, Conn. 06770

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
95% minimum

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1-I

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 202

13.3 **Boiling Point at 1 atm** Very high

13.4 **Freezing Point** 19.4°F = −7.0°C = 266.2°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.85 at 15°C (liquid)

13.8 **Liquid Surface Tension**
(est.) 30 dynes/cm = 0.03 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
(est.) 30 dynes/cm = 0.03 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization**
(est.) 110 Btu/lb = 60 cal/g = 2.5 × 10^5 J/kg

13.13 **Heat of Combustion:** (est.) = −19,200 Btu/lb = −10,100 cal/g = −422 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 4 and 5

NOTES

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LAC	# LEAD ACETATE

Common Synonyms
Lead acetate trihydrate
Neutral Lead acetate
Normal lead acetate

Solid White Odorless

Sinks and mixes with water

[illegible] ONLY [illegible] KEEP PEOPLE AWAY
[illegible]

Fire

[illegible] FLAMMABLE

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
If inhaled will cause dizziness or loss of consciousness
[illegible]
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen
SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness
[illegible]
Flush eyes with plenty of water
IN EYES [illegible] plenty of water
IF SWALLOWED [illegible] CONSCIOUS [illegible] water [illegible] and induce vomiting
IF SWALLOWED [illegible] NO CONSCIOUS PERSON, GIVING CONVULSIONS [illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Restrict access
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lead acetate trihydrate, Neutral lead acetate, Normal lead acetate, Salt of Saturn, Sugar of lead
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** $Pb(C_2H_3O_2)_2 \cdot 3H_2O$
3 4 **IMCO/United Nations Numerical Designation:** 9, 1616

4 OBSERVABLE CHARACTERISTIC

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White (commercial grades are frequently brown or grey lumps)
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask and protective gloves
5 2 **Symptoms Following Exposure** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders, colic, constipation, etc., weakness, which may go on to paralysis, chiefly of the extensor muscles of the wrists and less often of the ankles. Noticeable in chronic serious cases. Ingestion of a large amount causes loss of alimentary tract pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in 1 or 2 days. Contact with eyes causes irritation
5 3 **Treatment for Exposure.** Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value; immediately place the individual under medical care. INGESTION: give gastric lavage using 1% solution of sodium or magnesium sulfate. Leave 15–30 gm magnesium sulfate in ½ cup of water in the stomach as antidote and cathartic. Egg white, milk, and tannin are useful demulcents. Atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYE or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (as Pb)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2, LD₅₀ = 5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air.** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Irritating acid fumes may be formed in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
90 ppm/16–144 days/catfish/blood cell injury/tap water
7.46 mg/l (as Pb)/4 days/minnow/11 n soft water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential** Fish and terrestrial animals are capable of concentrating lead

9 SELECTED MANUFACTURERS

1 Frio Color and Chemical Corp
38° Madison Ave
New York, N Y 10017
2 Mallinckrodt Chemical Works
222 Westside Ave
P O Box 383
Jersey City, N J 07303
3 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown, N J 07960

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** "C" Reagent, Technical 97%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 379.3
13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.55 at 20°C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on page 5-LAC

NOTES

LAR — LEAD ARSENATE

Common Synonyms
Lead arsenate acid
Plumbous arsenate

Solid | White | Odorless

Sinks in water

AVOID CONTACT WITH SOLID. Keep people away.
Notify local health and pollution control agencies.
Protect water intakes.
Notify operators of canals, reservoirs, and other water supplies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
SOLID
POISONOUS IF SWALLOWED
IF SWALLOWED and victim is CONSCIOUS, have victim drink water, milk, and induce vomiting.
SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: Do not induce vomiting. Keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intake.
Notify operators of canals, reservoirs, and other water supplies.
Notify local health and wildlife officials.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

In case of fire, keep drums, containers, and surroundings cool with water spray.
Should be removed.
Chemical and physical treatment.

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Lead arsenate acid
Plumbous arsenate

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:** $PbHAsO_4$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Dust respirator, protective clothing to prevent skin contamination or ingestion. Eye protection.

5.2 **Symptoms Following Exposure** Inhalation or ingestion causes dizziness, headache, pain in joints, cramps, and paralysis, coma. Subacute dose causes inability, loss of weight, anemia, constipation. Blue line and urine concentrations of lead in case.

5.3 **Treatment for Exposure** Vapor: no medical treatment is used for exposure to this chemical. Call a physician immediately. Give victim a tablespoon of salt in glass of warm water and repeat until vomit is clear. Then give two tablespoons of epsom salt in milk of magnesia in half a glass of water. Have victim lie down and keep quiet.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not established

5.5 **Short-Term Inhalation Limits:** Not determined

5.6 **Toxicity by Ingestion** Grade 4. Probable oral lethal dose (human) 5 to 50 grams / kg

5.7 **Late Toxicity** Lead poisoning

5.8 **Vapor (Gas) Irritant Characteristics.** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics.** None

5.10 **Odor Threshold:** Not determined

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable

6.2 **Flammable Limits in Air**
Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products**
Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** Not flammable

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
1.4 ppm 48h Bioassay [illegible]

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)**
None

8.4 **Food Chain Concentration Potential**
Data not available

9 SELECTED MANUFACTURERS

1. Chemipa Chemical Co. Inc.
260 Madison Ave.
New York, N.Y. 10016
2. Chevron Chemical Co.
Ortho Division
940 Hensley St.
Richmond, Calif. 94804
3. FMC Corp.
Niagara Chemical Division
Middleport, N.Y. 14105

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 94%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight.** 347.9

13.3 **Boiling Point at 1 atm** Decomposes

13.4 **Freezing Point** Not applicable

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** 5.90 at 15°C

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension**
Not determined

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization**
Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on next card.

NOTES

LFB — LEAD FLUOROBORATE

Common Synonyms
Lead fluoborate
Lead fluoroborate solution

Liquid | Colorless | Odorless

Sinks and mixes with water

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
Wear goggles and self-contained [illegible]
[illegible]

Fire

Not flammable
Irritating gases may be produced when heated
[illegible]

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
If inhaled will cause dizziness or loss of consciousness
[illegible]
LIQUID
Will burn skin and eyes
If swallowed will cause nausea vomiting or loss of consciousness
[illegible]
IF EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Issue warning - water contaminated
Restrict access
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lead fluoborate
Lead fluoroborate solution

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Pb(BF_4)_2 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Faint

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves face shield rubber apron

5 2 **Symptoms Following Exposure.** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders colic constipation [illegible] weakness which may [illegible] to paralysis chiefly of the extensor muscles If the wrists are involved more often than the ankles is noticeable [illegible] In most cases Ingestion of large amounts causes local irritation of the alimentary tract pain leg cramps muscle weakness paresthesia depression coma and death may follow in 1 or 2 days Contact with eyes or skin may cause burns and ulceration

5 3 **Treatment for Exposure:** Remove at once all cases Heavy intoxication from further exposure until the blood level is reduced to a safe [illegible] immediately place the individual under medical care INGESTION give gastric lavage using 1% solution of sodium or magnesium sulfate leave [illegible] 30 gm magnesium sulfate in 6 8 oz of water in the stomach as antidote and catharticeff white milk and tannin are useful demulcents atropine sulfate and other antispasmodics may relieve abdominal pain but morphine may be necessary EYES [illegible] shower baths quantities of water for 5 min SKIN wash area with soap and water [illegible] an acid burn

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0 2 mg m (as lead)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 0 5 mg kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic and irritating hydrogen fluoride gas may form in fire

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** Solution is acid and will corrode most metals

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Flush with water rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** May be toxic

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential** Bioconcentrative

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
P O Box 1057R
Morristown N J 07960

2 The Harshaw Chemical Co
1945 E 97th St
Cleveland Ohio 44106

3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 50 0 2% solutions in water

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3)

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** Mixture

13 3 **Boiling Point at 1 atm** Not pertinent

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 [illegible] at 20 C (liquid)

13 8 **Liquid Surface Tension** Data not available

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

[illegible]

NOTES

LFR	# LEAD FLUORIDE

Common Synonyms
Lead difluoride
Plumbous fluoride

Solid | White | Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY

Fire

Not flammable

Exposure

DUST
POISONOUS IF INHALED
If inhaled will cause dizziness or loss of consciousness

SOLID
Irritating to skin and eyes
If swallowed will cause nausea vomiting or loss of consciousness

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Lead difluoride
Plumbous fluoride

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula.** PbF2

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

Dust and fumes of all but the most insoluble lead compounds are readily absorbed on inhalation and to a lesser degree after ingestion

5 1 **Personal Protective Equipment:** Respirator for heavy dust exposure safety goggles

5 2 **Symptoms Following Exposure.** No irritation to skin or mucous membranes protect against chronic poisoning Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders colic constipation etc weakness which may progress to paralysis chiefly of the extensor muscles of the wrists and less often the ankles is noticeable in the most severe cases Ingestion of a large amount causes local irritation of the alimentary tract pain ice cramps muscle weakness paresthesias depression coma and death may follow in one 2 days Contact with eyes causes irritation

5 3 **Treatment for Exposure** Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value immediately place the individual under medical care INGESTION give gastric lavage using 1% solution of sodium or magnesium sulfate leave 15 30 gm magnesium sulfate in 6 8 oz of water in the stomach as cathartic egg white milk and tannic are used Demulcents atropine sulfate and other antispasmodics may relieve abdominal pain but morphine may be necessary EYES or SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0 15 mg m³ as lead

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 LD50 Not available

5 7 **Late Toxicity** Data not available

Continued on page 4

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.**

6 6 **Behavior in Fire**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 7 45 mg l as Pb) 4 days minnow TLm soft water

8 2 **Waterfowl Toxicity:** May be toxic

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential** Bioconcentrative

9. SELECTED MANUFACTURERS

1 Ozark Mahoning Co
1870 South Boulder
Tulsa Okla 74119

2 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 206 North
Somerville N J 08876

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Technical C P
Optical grade

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 245 19

13 3 **Boiling Point at 1 atm** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 8 24 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 4

5 HEALTH HAZARDS (Cont'd)

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold** Data not available

LID	# LEAD IODIDE

Common Synonyms	Solid	Bright Yellow	Odorless
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear Self-Contained Breathing Apparatus
Wear Protective Clothing
In Case of Contact with Material, Immediately Flush Skin or Eyes with Plenty of Water for at Least 15 Minutes
For Minor Skin Contact, Avoid Spreading Material on Unaffected Skin

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
If inhaled will cause dizziness or loss of consciousness
Remove victim to fresh air
If not breathing, give artificial respiration
If breathing is difficult, give oxygen
SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness
Remove victim to fresh air
If not breathing, give artificial respiration
IN EYES: Immediately flush eyes with plenty of water for at least 15 minutes
If SWALLOWED: Induce VOMITING by giving two glasses of water or milk and induce vomiting
If SWALLOWED: If victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** PbI_2
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Bright yellow
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask and protective gloves

5.2 **Symptoms Following Exposure:** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders with constipation etc., weakness which may progress to paralysis, chiefly of the extensor muscles of the wrists and less often the ankles in more severe cases. In the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract. Pain, leg cramps, muscle weakness, paresthesias, depression, coma and death may follow in 1 or 2 days. Contact with eyes causes irritation.

5.3 **Treatment for Exposure:** Remove at once all cases of lead intoxication from further exposure. If the blood level is reduced to a safe value immediately place the individual under medical care. INGESTION: give purge. Lavage using 1% solution of sodium or magnesium sulfate. Leave 15 - 30 mg magnesium sulfate in GI. Use of water in the stomach as antidote and cathartic. Give white milk and tannin are useful demulcents. Atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES or SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.15 mg/m³ (as lead)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; LD50: 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire.**
6.7 **Ignition Temperature.** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Moderate
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** Bioconcentrative

9 SELECTED MANUFACTURERS

1. RSA Corporation
660 Sawmill River Road
Ardsley, N.Y. 10502
2. Ventron Corp.
P.O. Box 159
Beverly, Mass. 01915
3. Mallinckrodt Chemical Works
St. Louis, Mo. 63160

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99.5% - NF
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 461.03
13.3 **Boiling Point at 1 atm.** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 6.16 at 20°C (solid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

LNT	# LEAD NITRATE

Common Synonyms			
Nitrate of Lead Plumbi	Solid	White	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear protective clothing
In fire, isolate for ½ mile
In spill or leak, isolate for ½ mile
Ventilate closed spaces before entering

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Contact supplier for fire control instructions
Dike for containment

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
If inhaled will cause dizziness or loss of consciousness
Wear self-contained breathing apparatus
Wear chemical protective clothing
Full protective equipment

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness
Keep victim calm
Avoid physical exertion
IF INHALED remove victim to fresh air
IF SWALLOWED induce vomiting by tickling back of throat
Keep victim warm and quiet
IF SWALLOWED and victim is CONSCIOUS AND ALERT, GIVE 2-4 GLASSES OF WATER OR MILK
Get medical attention

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-1

Evacuate unnecessary personnel
Ventilate closed spaces before entering
Remove all sources of ignition
Dike for containment
Recover free liquid
Dispose of absorbent

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nitrate of lead; Plumbi nitrate
3.2 **Coast Guard Compatibility Classification:** Not Listed
3.3 **Chemical Formula:** $Pb(NO_3)_2$
3.4 **IMCO/United Nations Numerical Designation:** 1469

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid
4.2 **Color:** White
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask and protective gloves
5.2 **Symptoms Following Exposure:** Early symptoms of lead intoxication via inhalation or ingestion are nonspecific, commonly gastrointestinal in nature, and consist of nausea, vomiting, colic, constipation or diarrhea, anorexia which may be accompanied by a sweet taste. In the extreme cases of the nervous and kidney dysfunction may be noticeable. The nervous system is the target and most characteristic effect is encephalopathy. Early symptoms may be insomnia, irritability, headache, dizziness, fatigue and muscle weakness, paresthesias, depression, coma and death may follow. Chronic exposure may cause anemia, loss of appetite, constipation, abdominal pain, colic, vomiting, and severe weight loss. Lead is a cumulative poison. Acute exposure may cause severe abdominal pain, bloody diarrhea, nausea, vomiting, and shock. Lead can cause severe kidney damage. Skin or eye exposure may cause irritation.
5.3 **Treatment for Exposure:** Remove victim to fresh air. Keep victim calm. Avoid physical exertion. If victim is not breathing, clear airway and apply artificial respiration, preferably with a demand valve resuscitator, such as inhalator or pulmotor. Do not use direct mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician immediately. Keep victim under medical observation and in bed. Keep victim warm and quiet. Have victim rinse mouth thoroughly with water. If victim is conscious and alert, induce vomiting by having victim drink two glasses of water or milk. Induce vomiting by touching back of throat with finger or by giving an emetic. Repeat until vomitus is clear. Do not induce vomiting or give anything by mouth to an unconscious person. Get medical attention. Remove victim immediately to hospital. Call a physician. Keep victim under observation and in bed. Keep victim calm and

LTT — LEAD TETRAACETATE

Common Synonyms
Lead IV acetate

Wet Crystals — Lavender Pink — Vinegar like Odor

Reacts with water

[illegible]

Fire

Not flammable
Will increase the intensity of a fire

Exposure

CAUTION [illegible]
LIQUID SOLID
Irritating to skin and eyes
If swallowed will cause nausea vomiting or loss of consciousness
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

[illegible]
Restrict access
Dispose and flush

2 LABEL

OXIDIZER

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Lead IV acetate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $Pb(CH_3COO)_4$ CH_3COOH
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Crystals with a [illegible] acetic acid
4.2 **Color:** [illegible]
4.3 **Odor:** [illegible] vinegar

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield rubber gloves
5.2 **Symptoms Following Exposure:** Early symptoms of lead [illegible] are [illegible] gastrointestinal disorders [illegible] paralysis chiefly of the extensor muscles of the wrists and less often of the ankles is noticeable in the most serious cases. Ingestion of a large amount causes [illegible] [illegible] [illegible]

LTC — LEAD THIOCYANATE

Common Synonyms			
Lead sulfocyanate	Solid	White	Odorless
	Sinks and mixes with water		

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
POISONOUS IF INHALED
If inhaled will cause dizziness or loss of consciousness

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lead sulfocyanate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Pb(SCN)_2$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Early symptoms of lead intoxication by inhalation or ingestion are most commonly gastrointestinal disorders, colic, constipation, etc., weakness which may progress to paralysis of the extensor muscles of the wrists and less often of the ankles. In the most serious cases, ingestion of a large amount can cause loss of the sensory and motor faculties, muscle weakness, paresthesias, depression, coma and death may follow in a few days. Contact causes transient eye and mild irritation of skin.

5 3 **Treatment for Exposure:** Remove all contaminated clothing. Flush contamination from eyes or skin with water. If exposure is by inhalation, the individual should be taken to fresh air immediately. If breathing has stopped, artificial respiration should be administered. If the individual is conscious, medical aid should be obtained immediately. If ingestion has occurred, induce vomiting by giving a tablespoonful of salt in a glass of warm water. Repeat until vomit fluid is clear. Then give a solution of sodium or magnesium sulfate (one tablespoonful of salt or magnesium sulfate to a glass of water) to induce catharsis. Do not give stimulants such as caffeine and barbiturates (eg, phenobarbital) and tranquilizers such as chlordiazepoxide. Antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³ as Pb
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2 [Dunn, Sprague]
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Irritating sulfur dioxide gas may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** May be toxic
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** Bioconcentrative

9. SELECTED MANUFACTURERS

1 Fielding Chemicals Co
P O Box 31
Jersey City, N J 07303

2 Gallard-Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Eastman Organic Chemicals
Rochester, N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Practical, Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Nonflammable
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poison Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 324.4
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 3.82 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

LAL	LINEAR ALCOHOLS

Common Synonyms
Dodecanol
Tridecanol
Tetradecanol
Pentadecanol

Liquid | Colorless | Mild alcohol odor

Floats on water

Fire

Combustible

Exposure

CAUTION MATERIAL

LIQUID
Irritating to skin
Will burn eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dodecanol Tetradecanol Tridecanol Pentadecanol (Could be any of the above or mixtures thereof)

3 2 **Coast Guard Compatibility Classification:** Alcohol

3 3 **Chemical Formula:** $CH_3(CH_2)_nCH_2OH$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Eye protection

5 2 **Symptoms Following Exposure:** Direct contact can produce eye irritation. Low concentrations

5 3 **Treatment for Exposure:** Wash eyes with water for at least 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 1 Dose 15 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** None

5 9 **Liquid or Solid Irritant Characteristics:** Non-appreciable hazard. Practically harmless

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 215 F OC

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Water fog, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water stream may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Not reactive

7 2 **Reactivity with Common Materials:** Not reactive

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 2% 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Ethyl Corp
Industrial Chemical Div
Baton Rouge, La 70801

Shell Chemical
Industrial Chemical Div
Houston, Tex 77001

Union Carbide Corp
Chemicals and Plastics Div
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

XIII

12 HAZARD CLASSIFICATIONS

12 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** > 200

13 3 **Boiling Point at 1 atm:** > 260 F > 127 C

13 4 **Freezing Point:** > 24 F > -4 C

13 5 **Critical Temperature:** No data

13 6 **Critical Pressure:** No data

13 7 **Specific Gravity:** 0.83 @ 20/20 C

13 8 **Liquid Surface Tension:** No data

13 9 **Liquid-Water Interfacial Tension:** No data

13 10 **Vapor (Gas) Specific Gravity:** No data

13 11 **Ratio of Specific Heats of Vapor (Gas):** No data

13 12 **Latent Heat of Vaporization:** No data

13 13 **Heat of Combustion:** 19,000 Btu/lb (-11,000 cal/g)

13 14 **Heat of Decomposition:** No data

13 15 **Heat of Solution:** No data

13 16 **Heat of Polymerization:** No data

NOTES

LNG	# LIQUEFIED NATURAL GAS

Common Synonyms
LNG

Liquefied gas | Colorless | Odorless or weak skunk odor

Floats and boils on water. Flammable vapor cloud is produced.

Fire

FLAMMABLE
Flashback of the vapor trail may occur
May explode if ignited in confined area

Exposure

VAPOR
Not irritating to eyes, nose or throat
If inhaled, will cause dizziness, difficult breathing or loss of consciousness

LIQUID
Will cause frostbite

Water Pollution

Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms.
3.2 Coast Guard Compatibility Classification
Paraffin
3.3 Chemical Formula.
3.4 IMCO United Nations Numerical Designation.

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment
5.2 Symptoms Following Exposure:
5.3 Treatment of Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits
5.6 Toxicity by Ingestion.
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics.
5.9 Liquid or Solid Irritant Characteristics.
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point.
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products.
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water
7.2 Reactivity with Common Materials
7.3 Stability During Transport.
7.4 Neutralizing Agents for Acids and Caustics.
7.5 Polymerization.
7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity
8.2 Waterfowl Toxicity
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation.

Category	Rating
Health	
Flammability	
Reactivity	

12.3 NFPA Hazard Classifications

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm.
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm
13.4 Freezing Point
13.5 Critical Temperature
13.6 Critical Pressure
Specific Gravity:
13.8 Liquid Surface Tension
13.9 Liquid-Water Interfacial Tension
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization
13.13 Heat of Combustion.
13.14 Heat of Decomposition.
13.15 Heat of Solution.
13.16 Heat of Polymerization.

NOTES

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LPG — LIQUEFIED PETROLEUM GAS

Common Synonyms
Propane-butane(propylene)
Petrogas
LPG

Liquefied compressed gas Colorless Weak odor may have skunk odor added

Floats and boils on water. Flammable vapor cloud is produced

Stop discharge if possible. Keep people away.
Most fumigants are flammable. Keep upwind and avoid all water sources. Keep unnecessary people away; isolate hazard area and deny entry. Stay out of low areas. Ventilate closed spaces before entering. Keep out of water supply. Notify local health and pollution control officials.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Containers may explode in fire
May explode if ignited in an enclosed area

Stop flow if possible.
Use water to keep fire exposed containers cool and disperse vapors. Let fire burn.

Exposure

VAPOR
Not irritating to eyes, nose and throat.
If inhaled, will cause dizziness, difficult breathing or loss of consciousness.

CALL FOR MEDICAL AID.

LIQUID
Will cause frostbite.

Wear protective clothing when risk of exposure.
Wash with soap and water.
Remove and isolate contaminated clothing and shoes.
For severe exposure, call a doctor.

Flush affected areas with plenty of water.
DO NOT RUB AFFECTED AREAS.

Water Pollution

Not harmful to aquatic life.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, Cg 446-4

Evacuate personnel.
Remove sources of ignition.
Ventilate area.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms Butane; Propane; Propylene; Butylene; LP-Gas; LPG
3.2 Coast Guard Compatibility Classification Paraffin or olefin
3.3 Chemical Formula C_3H_8; C_4H_{10}; C_3H_6; C_4H_8
3.4 IMCO United Nations Numerical Designation None

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped) Liquefied compressed gas
4.2 Color Colorless
4.3 Odor Mild petroleum odor; LPG's are normally odorless but commercial grades usually have an added odorant

5 HEALTH HAZARDS

5.1 Personal Protective Equipment Self-contained breathing apparatus; Neoprene gloves
5.2 Symptoms Following Exposure Vapor irritating to eyes, nose and throat. Inhaled vapor causes dizziness, difficult breathing or loss of consciousness. Liquid causes frostbite.
5.3 Treatment of Exposure Remove victim to fresh air; apply artificial respiration if not breathing; keep warm and quiet; get medical attention.
5.4 Toxicity by Inhalation (Threshold Limit Value) 1000 ppm
5.5 Short-Term Inhalation Limits Data lacking
5.6 Toxicity by Ingestion Not toxic
5.7 Late Toxicity None
5.8 Vapor (Gas) Irritant Characteristics Vapor causes irritation of eyes, nose and throat.
5.9 Liquid or Solid Irritant Characteristics. Liquid causes frostbite. Prolonged contact with skin may cause irritation. Wash with soap and water. Wear protective clothing when risk of exposure.
5.10 Odor Threshold 1000 ppm

6 FIRE HAZARDS

6.1 Flash Point Propane -156°F (CC); -104°F (OC); Butane -76°F (CC); -60°F (OC)
6.2 Flammable Limits in Air. Propane 2.37 - 9.5 volume percent; Butane 1.86 - 8.4 volume percent
6.3 Fire Extinguishing Agents Water may not be effective as an extinguishing agent but should be used to cool containers exposed to fire. Water fog is preferred.
6.4 Fire Extinguishing Agents Not to be Used Water directly in containers
6.5 Special Hazards of Combustion Products Not pertinent
6.6 Behavior in Fire Containers may explode in fire. Vapor may travel to source of ignition and flash back. Containers should be cooled with water from unmanned hose holders or monitor nozzles.

Continued on page 4

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water No reaction
7.2 Reactivity with Common Materials No reaction
7.3 Stability During Transport Stable
7.4 Neutralizing Agents for Acids and Caustics Not pertinent
7.5 Polymerization Not pertinent
7.6 Inhibitor of Polymerization Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity None
8.2 Waterfowl Toxicity None
8.3 Biological Oxygen Demand (BOD) None
8.4 Food Chain Concentration Potential None

9 SELECTED MANUFACTURERS

Exxon Co
Houston, TX 77001

Phillips Petroleum Co
Bartlesville, OK 74004

Sun Oil Co
St. Davids, PA 19087

10 SHIPPING INFORMATION

10.1 Grades of Purity Various grades; commercial propane, isomerized propane, butane and mixtures may be included. The proportions are specified by the customer.
10.2 Storage Temperature Ambient
10.3 Inert Atmosphere No requirement
10.4 Venting Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

ABCDEFG

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations Flammable compressed gas
12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating
Fire	4
Health	
Vapor Effects	0
Liquid Skin Effects	0
Poison	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effects	0
Reactivity	
Other Chemicals	0
Water	0
Self-Reactivity	0

12.3 NFPA Hazard Classifications

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 Physical State at 15°C and 1 atm Gas
13.2 Molecular Weight 44.09
13.3 Boiling Point at 1 atm -44.0°F = -42.2°C = 231.0°K
13.4 Freezing Point Not reported
13.5 Critical Temperature 206.0°F = 96.7°C = 369.8°K
13.6 Critical Pressure. 616.3 psia = 41.94 atm = 4.249 MN/m²
13.7 Specific Gravity 0.504 at 60°F (Liquid)
13.8 Liquid Surface Tension 0.008 N/m at 20°C
13.9 Liquid-Water Interfacial Tension 0.05 N/m at 20°C
13.10 Vapor (Gas) Specific Gravity 1.5
13.11 Ratio of Specific Heats of Vapor (Gas) 1.126
13.12 Latent Heat of Vaporization 185 Btu/lb = 103 cal/g = 4.32 x 10⁵ J/kg
13.13 Heat of Combustion -21,592 Btu/lb = -11,996 cal/g = -502.0 x 10⁵ J/kg
13.14 Heat of Decomposition Not pertinent
13.15 Heat of Solution Not pertinent
13.16 Heat of Polymerization Not pertinent

*Physical properties are for pure propane. Consult LPG expert for properties of mixtures.

Continued on page 4

6 FIRE HAZARDS (Cont'd)

6.7 Ignition Temperature 920°F = 493°C = 766°K
6.8 Electrical Hazard Class I, Group D
6.9 Burning Rate 2.0 mm/min

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LTH	# LITHARGE

Common Synonyms

Lead monoxide
Lead oxide yellow
Plumbous oxide
Lead Protoxide

Solid | Gray or yellow green or red brown | Odorless

Sinks in water

Keep people away
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

SOLID OR DUST

Irritating to eyes
Harmful if inhaled
Move victim to fresh air
Promptly flush eyes with plenty of water
If SWALLOWED and victim CONSCIOUS have victim drink water or milk and have victim induce vomiting
If SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS [illegible] except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Should be removed
Chemical and physical treatment

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lead monoxide Lead oxide yellow Lead protoxide Massicot Plumbous oxide

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula** PbO

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color** Yellow to red low-metal content oxides yellow to green to brown high metal content oxides gray to brown

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** [illegible] metal fume respirator gloves goggles

5 2 **Symptoms Following Exposure.** (General symptoms of lead poisoning (delayed) inhalation or ingestion causes abdominal pain (lead colic) metallic taste in mouth loss of weight pain in muscles and muscular weakness Dust may irritate eyes

5 3 **Treatment for Exposure** Consult physician after ingestion or exposure to high concentrations of dust INGESTION Call physician at once Induce vomiting and give milk and magnesium sulfate (Epsom salt)

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.15 mg/m

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity** Impairs development of human fetal connective tissue cell

5 8 **Vapor (Gas) Irritant Characteristics** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** > 56,000 ppm/96 hr/mosquito fish
TL_m turbid water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** Data not available

9 SELECTED MANUFACTURERS

1 NL Industries Inc
Pigment and Chemicals Division
425 University Avenue
Westwood Mass 02090

2 J T Baker Chemical Co
Phillipsburg N J 08865

3 Eagle Picher Industries Inc
Chemicals and Ethers Division
American Building
Cincinnati Ohio 45202

10. SHIPPING INFORMATION

10 1 **Grades or Purity** Low metal-content oxides contain 98 to 99 8% High metal or battery grades contain 90 to 95% Reagent purified Most grades available in several particle sizes

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight.** 223.2

13 3 **Boiling Point at 1 atm.** Not pertinent (Decomposes)

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 9.5 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion** No pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(continued on page 5 and 6)

NOTES

LAH — LITHIUM ALUMINUM HYDRIDE

Common Synonyms
LAH

Solid powder | White to gray | Odorless

Reacts violently with water. Flammable gas is produced.

Avoid contact with solid and dust
Wear protective clothing including gloves
Stop leak if possible. Keep people away
Shut off ignition sources and call fire department
Isolate area until gas has dispersed
Notify local health and pollution control agencies

Fire

FLAMMABLE
Flammable gas is released on contact with water, metals or acids
Wear rubber gloves, clothing, and footwear
DO NOT USE WATER, DRY CHEMICAL, CARBON DIOXIDE OR FOAM
Extinguish with powdered limestone or powdered graphite

Exposure

CALL FOR MEDICAL AID

SOLID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: Hold eyelids apart. Flush with plenty of water
IF SWALLOWED and victim CONSCIOUS: Induce vomiting; give water

Water Pollution

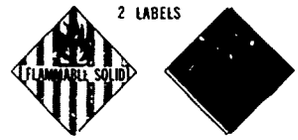
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Isolate area. High fire hazard.
Corrosive.
Restrict access.
Dispersed flammable gas.

2 LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** LAH
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula** $LiAlH_4$
3.4 **IMCO United Nations Numerical Designation** 4.3/1410

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color** White to gray
4.3 **Odor** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Rubber gloves, full face shield
5.2 **Symptoms Following Exposure** Contact with solid and dust causes severe burns to eyes, skin and mucous membranes; ingestion causes severe caustic burns
5.3 **Treatment for Exposure** Do not induce vomiting. Wash skin with soap and water. Wash affected areas with large amounts of water. Provide artificial respiration if necessary
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not established
5.5 **Short-Term Inhalation Limits** Not established
5.6 **Toxicity by Ingestion** Data not available
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics** Moisture on eyes will cause severe burns
5.10 **Odor Threshold** Not established

6. FIRE HAZARDS

6.1 **Flash Point** Solid
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents.** Powdered graphite, powdered salt or powdered limestone
6.4 **Fire Extinguishing Agents Not to be Used** Do NOT use water, sodium acid carbonate, carbon dioxide or dry chemical
6.5 **Special Hazards of Combustion Products** Data not available
6.6 **Behavior in Fire.** Decomposes at 257°F to form hydrogen. The hydrogen generated may ignite and/or explode
6.7 **Ignition Temperature** Data not available
6.8 **Electrical Hazard** Class I, Group B
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Reacts violently with water as a solid or when dissolved in ether. The hydrogen produced by the reaction with water is a major hazard and necessitates adequate ventilation
7.2 **Reactivity with Common Materials:** Can burn in heated or moist air
7.3 **Stability During Transport** Normally stable, unstable at high temperatures
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Belmont Smelting & Refining Works, Inc.
   330 Belmont Ave.
   Brooklyn, N.Y. 11220
2. Foote Mineral Co.
   Route 100
   Exton, Pa. 19341
3. Vertron Corp.
   Chemical Division
   Beverly, Mass. 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 95-98%
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** Dry air
10.4 **Venting** Steel container is well ventilated and dated

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

RRC

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2
	W

12 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight** 37.95
13.3 **Boiling Point at 1 atm** Decomposes
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity.** 0.917 at 15°C (solid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

NOTES

REVISED 1978

LHD	# LITHIUM HYDRIDE

Common Synonyms

Solid Crystals are gray or blue; powder is white Odorless

Reacts violently with water
Flammable gas is produced

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear full eye protection and full protective clothing.
Stay upwind.
Isolate spill or leak area for at least
Notify local health and pollution control agencies.

Fire

Combustible
Irritating flammable gas may be produced when heated.
Extinguish with dry chemical powder or burrow powder.
DO NOT USE WATER, FOAM, CARBON DIOXIDE OR OTHER CHEMICALS ON FIRE OR ADJACENT AREA.

Exposure

ALL FORMS MEDICAL AID

DUST
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing
Remove victim to fresh air; if not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, trained personnel should give oxygen. Keep victim warm and quiet. Get medical attention.

SOLID
Will burn skin and eyes
If swallowed will cause nausea or loss of consciousness
Remove victim to fresh air.
Flush eyes with plenty of water.
IF IN EYES: Hold eyelids apart and flush with plenty of water.
IF SWALLOWED: Induce VOMITING as directed by medical personnel.
IF SWALLOWED by victim UNCONSCIOUS OR HAVING CONVULSIONS: Do not induce vomiting. Get medical attention.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Isolate, warning, hazard, flammability, corrosive.
Restrict access.
Dike, and flush with water.

2 LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** No common synonyms
3.2 **Coast Guard Compatibility Classification** Not listed
3.3 **Chemical Formula** LiH
3.4 **IMCO/United Nations Numerical Designation** 1414

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color** Gray, blue crystalline material; fine powder and material ranges in color from white to gray
4.3 **Odor** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Gloves, boots, and full protective clothing. Breathing apparatus if dusty.
5.2 **Symptoms Following Exposure** Irritation of eyes, nose, throat, and lungs. Severe burns of skin and eyes. Exposure to dust may cause coughing, difficult breathing, and loss of consciousness. Contact with moisture on skin, eyes, or mucous membranes causes irritation.
5.3 **Treatment for Exposure** *Victim should not be left unattended.* Remove victim to fresh air; if not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, trained personnel should give oxygen. Get medical attention. INHALATION: Keep victim warm and quiet. Get medical attention as soon as possible. INGESTION: Do not induce vomiting unless directed by medical personnel. EYES: Flush with plenty of water for at least 15 minutes. Get medical attention. SKIN: Wash with plenty of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.025 mg/m³
5.5 **Short-Term Inhalation Limits** Data not available
5.6 **Toxicity by Ingestion** Not established
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Data not available
5.9 **Liquid or Solid Irritant Characteristics** Data not available
5.10 **Odor Threshold** Does not stand alone

6 FIRE HAZARDS

6.1 **Flash Point** Not pertinent (combustible solid)
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents** Dry chemical, graphite or lithium chloride
6.4 **Fire Extinguishing Agents Not to be Used** Never use water, foam, carbon dioxide, halogenated hydrocarbons, or vaporizing liquids
6.5 **Special Hazards of Combustion Products** Irritating flammable gas may be produced
6.6 **Behavior in Fire** Material decomposes when heated to produce flammable hydrogen gas. Reacts violently with water to produce heat and flammable gas which may explode or burn
6.7 **Ignition Temperature** 392°F
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Reacts violently with water to form flammable hydrogen gas and strong caustic solution; ignition may occur, especially with powder
7.2 **Reactivity with Common Materials** May ignite combustibles (wood, paper, oil, etc.) if they are damp
7.3 **Stability During Transport** Stable if dry and moisture is excluded
7.4 **Neutralizing Agents for Acids and Caustics** Residues should be washed with water, then treated with dilute acetic acid
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Not pertinent
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Lithium Corporation of America
P.O. Box
Bessemer City, NC 28016

Ventron Corp.
P.O. Box
Beverly, Mass. 01915

Pfizer Chemical Inc.
235 East 42nd
Stamford, Conn. 06902

10 SHIPPING INFORMATION

10.1 **Grades of Purity** Commercial 95%
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** Required
10.4 **Venting** Not pertinent

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

RR

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight** 7.95
13.3 **Boiling Point at 1 atm** Not pertinent (decomposes)
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity** 0.78 at 20°C (solid)
13.8 **Liquid Surface Tension** None
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** Data not available
13.14 **Heat of Decomposition** Data not available
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Use back of page for notes.

NOTES

LTM	# LITHIUM, METALLIC

Common Synonyms

Soft solid | White to light silver | Odorless

Reacts violently with water
Flammable gas is produced

AVOID CONTACT WITH SOLID. KEEP PEOPLE AWAY.
Wear protective clothing including eyes
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Irritating gases may be produced when heated

Wear goggles and self-contained breathing apparatus
Extinguish with dry graphite, sodium chloride or special powder
DO NOT USE WATER, FOAM, DRY CHEMICALS OR CARBON DIOXIDE ON FIRE
DO NOT USE WATER OR FOAM ON ADJACENT FIRES

Exposure

CALL FOR MEDICAL AID
SOLID
Will burn skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: Hold eyelids apart and flush with plenty of water
IF SWALLOWED: Induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS or having CONVULSIONS: Do nothing; keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearest water intakes

1 RESPONSE TO DISCHARGE

Remove all sources of ignition
Use clean, non-sparking tools to collect spilled material
Place in loosely covered plastic container for later disposal
Flush area with flooding amounts of water

2 LABELS

3 CHEMICAL DESIGNATIONS

- Synonyms: None
- Coast Guard Compatibility Classification: None
- Chemical Formula: Li
- IMCO/United Nations Numerical Designation: 1415

4 OBSERVABLE CHARACTERISTICS

- Physical State (as shipped): Solid
- Color: Silvery white
- Odor: None

5 HEALTH HAZARDS

Personal Protective Equipment: Goggles, self-contained breathing apparatus, protective clothing

Symptoms Following Exposure: Irritation of eyes, skin, nose, throat; burns; nausea; vomiting; convulsions

Treatment for Exposure: Call for medical aid. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids apart and flush with plenty of water. IF SWALLOWED: Induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS or having CONVULSIONS: Do nothing; keep victim warm.

Toxicity by Inhalation (Threshold Limit Value): Not established

Short Term Inhalation Limits: Not established

Toxicity by Ingestion: Moderately toxic

Late Toxicity: Not established

Vapor (Gas) Irritant Characteristics: Not established

Liquid or Solid Irritant Characteristics: Solid is irritating to eyes, skin, nose, throat

Odor Threshold: Not established

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
Combustible solid

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Graphite, sodium chloride

6.4 **Fire Extinguishing Agents Not to be Used:** Water, sand, halogenated hydrocarbons, carbon dioxide, soda acid or dry chemical

6.5 **Special Hazards of Combustion Products:** Strongly alkaline fumes are released in fire

6.6 **Behavior in Fire:** Molten lithium is quite easily ignited and is then difficult to extinguish. Hot or burning lithium will react with all gases except those of the helium group. It also reacts violently with water, wood, asphalt, sand, asbestos, and in fact can cause ignition of organic materials. Does not react with aluminum. Hydrogen is produced in reaction with water.

Continued on page 4

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Reacts violently to form flammable hydrogen gas and strong caustic solution. Ignition usually occurs

7.2 **Reactivity with Common Materials.** May ignite combustible materials if they are dry

7.3 **Stability During Transport:** Stable if dry and moisture are excluded

7.4 **Neutralizing Agents for Acids and Caustics:** Residues should be flushed with water, then rinsed with dilute acetic acid

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Foote Mineral Co
Route 100
Exton, Pa 19341

2. Lithium Corporation of America
Box 795
Bessemer City, N C 28016

3. Venus Corp
P O Box 59
Beverly, Mass 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure 99.9%
Powder, shot, wire, ribbon, rod

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Required

10.4 **Venting:** Safety vent

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

RR

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 6.942

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.53 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** 18 470 Btu/lb = 10 260 cal/g = 429.3×10^8 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 31 500 Btu/lb = 17 500 cal/g = 733×10^8 J/kg

13.16 **Heat of Polymerization:** Not pertinent

6 FIRE HAZARDS (Cont'd)

6.7 **Ignition Temperature:** 180°C

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

MGX	# MAGNESIUM

Common Synonyms	Solid	Silvery	Odorless
	Sinks in water		

Call fire department
Stop discharge if possible Keep people away
Isolate and deny entry (evacuate if necessary)
Notify local health and pollution control agencies

Fire

FLAMMABLE
Extinguish with dry graphite sodium chloride dry inert powder
DO NOT USE WATER FOAM CARBON DIOXIDE DRY CHEMICALS OR VAPORIZING LIQUID ON FIRE

Exposure

Call for medical aid
SOLID
Irritating to eyes
Harmful if swallowed
IF IN EYES Hold eyes open and flush with plenty of water
IF SWALLOWED If victim is CONSCIOUS give water drink water or milk

Water Pollution

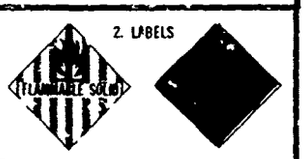
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Should not be moved
Chemical and physical treatment

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** No common synonyms
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula** Mg
3.4 **IMCO/United Nations Numerical Designation:**
Pellet, turnings or ribbon 4.1 1869
Powder, non pyrophoric 4.3 1418

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid
4.2 **Color** Silvery looks like aluminum
4.3 **Odor** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Eye protection
5.2 **Symptoms Following Exposure.** Dust irritates eyes in same way as any foreign material Penetration of skin by fragments of metal is likely to produce local irritation blisters and ulcers which may become infected
5.3 **Treatment for Exposure** EYES flush with water to remove dust SKIN treat as any puncture
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion** Minimum LDL (lowest lethal dose) = 230 mg/kg (rat)
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not pertinent (solid)
Flammable when in the form of fine chips or powder
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents** Inert dry powders (e.g. graphite limestone salt)
6.4 **Fire Extinguishing Agents Not to be Used.** Water foam halogenated agents carbon dioxide
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Burns with dense white smoke Flame is very bright
6.7 **Ignition Temperature.** 883°F
6.8 **Electrical Hazard.** Class I Group B
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** In finely divided form reacts with water and acids to release flammable hydrogen gas
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** None
8.2 **Waterfowl Toxicity** None
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. NL Industries Inc
Magnesium Division
238 North 2200 West
Salt Lake City, Utah 84116
2. Dow Chemical Co
Midland, Mich. 48640
3. Belmont Smelting and Refining Works Inc
330 Belmont Ave
Brooklyn, N.Y. 11226

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Pigs, ingots, turnings, sticks, all high purity
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Open flame arrester

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable solid
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	2 W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight** 24.3
13.3 **Boiling Point at 1 atm** 2012°F = 1100°C = 1373°K
13.4 **Freezing Point** 1202°F = 650°C = 923°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity** 1.74 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** -11,980 Btu/lb = -6,650 cal/g = -278 x 10^3 J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on page Sec. 5

NOTES

MPC	# MAGNESIUM PERCHLORATE

Common Synonyms	Solid	White	Odorless
Anhydrone Dehydrite Magnesium perchlorate anhydrous Magnesium perchlorate hexahydrate	Sinks and mixes with water		

[illegible] contact with [illegible] and [illegible] keep people away.
Stop discharge if possible.
Isolate and remove spilled material [illegible].
Notify [illegible] personnel [illegible].

Fire

Not flammable
May cause fire on contact with combustibles
Will increase the intensity of a fire
[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
[illegible] with plenty of water
[illegible] get medical attention
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness
Remove contaminated clothing at once
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water, milk or other non-toxic liquid
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning - oxidizing material
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Anhydrone Dehydrite
Magnesium perchlorate anhydrous
Magnesium perchlorate hexahydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $Mg(ClO_4)_2$

3 4 **IMCO/United Nations Numerical Designation:** 5 1 1478

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color** White

4 3 **Odor** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U S Bu Mines approved respirator, chemical safety goggles, face shield

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates mucous membranes. Ingestion of large amounts may be fatal. Immediate symptoms include abdominal pain, nausea and vomiting, diarrhea, pallor, blueness, shortness of breath, unconsciousness. Contact with eyes or skin causes irritation.

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air, get medical attention if irritation persists. INGESTION give large amounts of water, induce vomiting, call a physician. EYES flush with copious quantities of water for at least 15 min., call physician. SKIN flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable but may cause or increase the intensity of a fire

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.**

6 6 **Behavior in Fire:** Can form explosive mixture with combustible material of finely powdered metals. Increases the intensity of fires.

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Dissolves with liberation of heat. May cause spattering

7 2 **Reactivity with Common Materials:** Contact with wood, paper, oils, grease or finely divided metals may cause fires and explosions.

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Hooker Chemical Corporation
Industrial Chemicals Division
Niagara Falls, N Y 14302

2 Kerr McGee Chemical Corp
Kerr McGee Center
Oklahoma City, Okla 73102

3 D J Goldsmith Chemical & Metal Corp
909 Pitner Ave
Evanston, Ill 60202

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure anhydrous 65 - 68% solution of hexahydrate in water

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizing material

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 223 2

13 3 **Boiling Point at 1 atm:** Decomposes above 250°C

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2 21 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Data not available

13 15 **Heat of Solution:** 260 Btu/lb = 140 cal/g = 6.0×10^5 J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

MLT

MALATHION

Common Synonyms
Cythion Insecticide

Liquid | Yellow to dark brown | Skunk-like odor

Sinks in water. Freezing point is 37°F.

AVOID CONTACT WITH [illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED
Containers may explode in fire
[illegible]

Exposure

CALL FOR MEDICAL AID
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CON[illegible]
[illegible]

Water Pollution

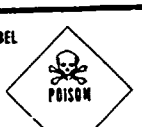
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison / water contaminant
Restrict access
Spill should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** CYTHION Insecticide
S-[1,2-Bis(ethoxycarbonyl) ethyl] O,O-dimethyl phosphorodithioate

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_{10}H_{19}O_6PS_2$

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1893

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Yellow to dark brown

4.3 **Odor:** Characteristic skunk like mercaptan

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus (or respirator for organophosphate pesticides) and rubber clothing while fighting fires of malathion with chlorine bleach solution. All clothing contaminated by fumes and vapors must be decontaminated.

5.2 **Symptoms Following Exposure:** Exposure to fumes from a fire or to liquid causes headache, blurred vision, constricted pupils of the eyes, weakness, nausea, cramps, diarrhea and tightness in the chest. Muscles twitch and convulsions may follow. The symptoms may develop over a period of 8 hours.

5.3 **Treatment for Exposure:** *Speed is essential.* INHALATION: In the nonbreathing victim *immediately* institute artificial respiration, using the mouth-to-mouth, the mouth-to-nose or the mouth-to-oropharyngeal method. *Call physician!* INGESTION: administer milk, water or salt water and induce vomiting repeatedly. SKIN OR EYE CONTACT: flood and wash exposed skin areas *thoroughly* with water. Remove contaminated clothing under a shower. Administer atropine, 2 mg (1/30 gr) intramuscularly or intravenously as soon as any local or systemic signs or symptoms of an intoxication are noted; repeat the administration of atropine every 3-8 min. until signs of atropinization (mydriasis, dry mouth, rapid pulse, hot and dry skin) occur. Initiate treatment in children with 1 mg of atropine. Watch respiration and remove bronchial secretions if they appear to be obstructing the airways; intubate if necessary. Give 2-PAM (Pralidoxime, *Protopam*) 2.5 gm in 100 ml of sterile water or in 5% dextrose and water intravenously slowly in 15-30 min. If sufficient fluid is not available, give 1 gm of 2-PAM in 3 ml of distilled water by deep intramuscular injection; repeat this every half hour if respiration weakens or if muscle fasciculation or convulsions recur.

6. FIRE HAZARDS

6.1 **Flash Point:** >325°F

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, water spray, foam

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Vapors and fumes from fires are hazardous. They include sulfur dioxide and phosphoric acid.

6.6 **Behavior in Fire:** Gives off hazardous fumes. Area surrounding fire should be diked to prevent water runoff.

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** None

7.2 **Reactivity with Common Materials:** No hazardous reaction

7.3 **Stability During Transport:** Not pertinent

7.4 **Neutralizing Agents for Acids and Caustics.** Liquid bleach solution for decontamination

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.09 ppm/96 hr/bluegill/TL_m/fresh water
0.033-0.083 ppm/96 hr/marine crustacean/LC_{50}

8.2 **Waterfowl Toxicity:** LD_{50}=1485 mg/kg

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

American Cyanamid Co.
Agricultural Division
P.O. Box 400
Princeton, N.J. 08540

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** CYTHION Insecticide, Malathion ULV Concentrate Insecticide. Many powders, dusts and sprays solutions are sold under a variety of trade names.

10.2 **Storage Temperature:** Below 120°F. Decomposition (non hazardous) occurs at higher temperatures.

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-X-1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 330.36

13.3 **Boiling Point at 1 atm.** Very high

13.4 **Freezing Point.** 37°F = 2.9°C = 276°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.234 at 25°C (liquid)

13.8 **Liquid Surface Tension.** 37.1 dynes/cm = 0.0371 N/m at 24°C

13.9 **Liquid-Water Interfacial Tension:** 19 dynes/cm = 0.019 N/m at 24°C

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

5. HEALTH HAZARDS (Cont'd.)

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 5 to 15 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** None likely

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

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MLI

MALEIC ACID

Common Synonyms
cis-Butenedioic acid
cis-1,2-Ethylenedicarboxylic acid
Maleinic acid
Malenic acid
Toxilic acid

Solid | White | Odorless

Sinks and mixes with water

[illegible]

Fire

Combustible

[illegible]

Exposure

[illegible] MEDICAL [illegible]

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

[illegible]

SOLID
Irritating to skin and eyes
Harmful if swallowed

[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Dispersal and Flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** cis-Butenedioic acid, cis-1,2-Ethylenedicarboxylic acid, Maleinic acid, Malenic acid, Toxilic acid

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** HOOC-CH=CH-COOH

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with eyes and skin causes irritation

5.3 **Treatment for Exposure:** INHALATION remove to fresh air. EYES immediately flush with plenty of water for 15 minutes, get medical attention if irritation persists. SKIN wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade: Practically [illegible] 0.5 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.**

6.5 **Special Hazards of Combustion Products.** Irritating smoke containing maleic anhydride may form on fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials.** May corrode metals when wet

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 240 ppm 24-48 hr mosquito fish TL_m fresh water
>ppm 96 hr fathead minnow TL_m fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 18% 5 days

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Co
Specialty Chemicals Div
P O Box 3067R
Morristown N J 07960

2. Mallinckrodt Chemical Works
223 Westside Ave
P O Box 464
Jersey City N J 07304

3. Eastman Organic Chemicals
Rochester N Y 14650

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Reagent, Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 116.1

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 266°F = 130°C = 403°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.59 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible] Btu lb = [illegible] cal g = [illegible] J kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

MLA — MALEIC ANHYDRIDE

Common Synonyms Toxilic anhydride cis-Butenedioic anhydride	Molten, or solid crystals or tablets Colorless Choking odor Sinks and mixes slowly with water

Avoid contact with solid and liquid. Keep people away.
Wear goggles with self-contained breathing apparatus and rubber coveralls including gloves.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Dust cloud may be ignited by spark or flame.
Wear goggles with self-contained breathing apparatus and rubber coveralls including gloves.
Extinguish with dry chemical, alcohol foam, carbon dioxide.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID.

LIQUID OR SOLID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is conscious, have victim drink water (two glasses).

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** cis-Butenedioic anhydride
2,5-Furanedione
Toxilic anhydride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_4O_3H_2$

3.4 **IMCO United Nations Numerical Designation.** 9.0

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid or liquid

4.2 **Color:** Colorless

4.3 **Odor:** Acrid, choking

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved organic vapor-acid gas canister, chemical goggles and face shield, rubber gloves and boots, coveralls, rubber apron.

5.2 **Symptoms Following Exposure:** Inhalation causes coughing, sneezing, throat irritation. Skin contact causes irritation and redness. Vapors cause severe eye irritation, photophobia and double vision may occur.

5.3 **Treatment for Exposure:** INHALATION: give oxygen. EYE OR SKIN CONTACT: flush with large amounts of water for at least 15 min; for eyes, call a physician. For solid, molten: burns require water and treat as chemical and thermal burn.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.25 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; LD50 = 0.5 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** 1.3 - 2.9 mg/m^3

6 FIRE HAZARDS

6.1 **Flash Point:** (Liquid) 215°F C.C., 240°F O.C.

6.2 **Flammable Limits in Air:** 1.4% - ?%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing.

6.5 **Special Hazards of Combustion Products:** Not pertinent.

6.6 **Behavior in Fire:** When heated above 400°F in the presence of various materials may generate heat and carbon dioxide will explode if confined.

6.7 **Ignition Temperature:** 890°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 1.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Hot water may cause boiling. Reacts with cold water to form acid and is hazardous.

7.2 **Reactivity with Common Materials.** No reaction.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Solid spills, if any, should be covered before any significant reaction with water occurs. Flush area of spill with water.

7.5 **Polymerization:** Very unlikely at ordinary temperatures, even in the molten state.

7.6 **Inhibitor of Polymerization.** None

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 150 ppm/24 hr/sunfish/TL$_m$/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 50% theory

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

2. Petro-Tex Chemical Corp.
8600 Park Place
Houston, Tex. 77017

3. United States Steel Corp.
USS Chemicals Division
Neville Island, Pa. 15225

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial 99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3.)

RR

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicants	2
Aquatic Toxicants	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	2
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 98.06

13.3 **Boiling Point at 1 atm:** 394°F = 202°C = 475°K

13.4 **Freezing Point:** 127°F = 53°C = 326°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.43 at 15°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** -5970 Btu/lb = -1330 cal/g = -23.3 × 10^5 J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** -153 Btu/lb = -85 cal/g = -3.56 × 10^5 J/kg

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

MLH MALEIC HYDRAZIDE

Common Synonyms

1,2-Dihydro-3,6-pyridazinedione
Maleic acid hydrazide
MH
Malazide
Regulox

Solid | White | Odorless

Sinks in water

[illegible] fire department
[illegible] people away
[illegible] and prevent discharge. Cover spill
[illegible] health and pollution [illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

[illegible]
DUST
Irritating to eyes, nose and throat
[illegible]
SOLID
Irritating to skin and eyes.
Harmful if swallowed
[illegible]
Flush affected areas with plenty of water
IF INHALED, Move victim to fresh air. Call for medical aid.
IF SWALLOWED, [illegible] CONSCIOUS, give victim water to drink

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2-Dihydro-3,6-pyridazinedione; 6-Hydroxy-3(2H)-pyridazinone; Maleic acid hydrazide; Malazide; MH; Regulox

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $C_4H_4N_2O_2$

3.4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Goggles or face shield, dust mask

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Contact with eyes or skin causes irritation. Ingestion has been observed to cause stomach abdominal spasms in test animals

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. INGESTION: get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade [illegible] oral LD_{50} [illegible] mg/kg range

5.7 **Late Toxicity:** Causes [illegible] in rats

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides are produced

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. The Uniroyal Company
   Chemical Division
   1 Stanton Street
   Marinette, Wis. 54143
2. Uniroyal Chemical Co.
   Spencer Street
   Naugatuck, Conn. 06770
3. Chemical Formulators, Inc.
   Box 26
   Saint Albans, W. Va. 25143

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 97+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight.** 112.1

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point.** 599°F = 298°C = 571°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.60 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion:** (est.) = -4,200 Btu/lb = -4,900 cal/g = -190 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

MAT

MERCURIC ACETATE

Common Synonyms

Solid | White | Mild vinegar like odor

Sinks and mixes with water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear goggles and self-contained [illegible]
[illegible]

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED WHEN HEATED.

Exposure

CALL FOR MEDICAL AID.
DUST.
POISONOUS IF INHALED.
[illegible]
SOLID.
POISONOUS IF SWALLOWED.
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant.
Restrict access.
Should be removed.
Chemical and physical treatment.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula:** $(CH_3CO_2)_2Hg$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid
4.2 **Color:** White
4.3 **Odor:** Slight acetic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, dust mask, goggles.
5.2 **Symptoms Following Exposure:** The general symptoms [illegible] developing rapidly after ingestion but more slowly after [illegible] exposures. Contact with eyes causes irritation and ulceration; on skin intact may cause dermatitis. Ingestion causes pain, vomiting, ulceration of mouth and stomach, diarrhea, failure, metabolic acidosis, pain, and rapid weak pulse.
5.3 **Treatment for Exposure:** Have victim rest. [illegible] EYES: FLUSH with water. INGESTION: call physician; poison should be removed from stomach as soon as possible; give milk, white of eggs beaten with water, [illegible] tablespoon in salt in a glass of warm water, and repeat until vomit fluid is clear; repeat milk or white eggs beaten with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade [illegible]
5.7 **Late Toxicity:** Intestinal bleeding and kidney damage may develop.
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent.
5.9 **Liquid or Solid Irritant Characteristics:** Data not available.
5.10 **Odor Threshold:** Not pertinent.

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable.
6.2 **Flammable Limits in Air:** Not flammable.
6.3 **Fire Extinguishing Agents:** Not pertinent.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
6.5 **Special Hazards of Combustion Products.** Smoke may contain toxic mercury or mercury oxide fumes.
6.6 **Behavior in Fire:** Not pertinent.
6.7 **Ignition Temperature:** Not pertinent.
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** Not pertinent.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.
7.2 **Reactivity with Common Materials.** No reaction.
7.3 **Stability During Transport:** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
[illegible] * Young salmon, lethal, fresh water
[illegible] Bluegill, fresh water
* Time interval not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential:** [illegible]

9 SELECTED MANUFACTURERS

[illegible]
Chemicals Division
Congress Street
Beverly, Mass. [illegible]

[illegible]
[illegible] Second Street
[illegible]

[illegible] Gallard-Schlesinger Chemical Manufacturing Co. and Mineola Av.
Carle Place, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** C.P. [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisonous Gas, B
12.2 **IMAS Hazard Rating for Bulk Water Transportation:** Not listed.
12.3 **NFPA Hazard Classifications.** Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight:** 318.7
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point.** Not pertinent.
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.25 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 4 and 5)

NOTES

MCC	MERCURIC AMMONIUM CHLORIDE

Common Synonyms

Mercuric chloride ammoniated
Mercuric ammonium chloride
Mercuric amide chloride
Ammoniated mercury

Solid White Odorless

Sinks in water

AVOID ANY CONTACT OF ANIMALS AND MAN
PEOPLE AWAY
[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
[illegible]

SOLID
POISONOUS IF SWALLOWED
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Hazardous Materials Handbook, Guide 61

Notify water pollution authorities
Restrict access
Should be removed
Chemical and physical treatment

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Mercuric ammonium chloride, Ammoniated mercury, Mercuric chloride, ammoniated, Mercuric ammonium chloride, Mercuric chloride, ammoniated
3.2 Coast Guard Compatibility Classification: Not applicable
3.3 Chemical Formula: $HgNH_2Cl$
3.4 IMCO/United Nations Numerical Designation: Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: White
4.3 Odor: None

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Gloves, goggles, respirator
5.2 Symptoms Following Exposure: The general symptoms [illegible] developing rapidly after ingestion [illegible] severe gastroenteritis [illegible] and ulceration. Skin contact may cause [illegible] Ingestion causes a strong metallic taste and burning in mouth, throat, and upper abdomen
5.3 Treatment for Exposure: Have person seek medical attention promptly. EYES OR SKIN: flush with water. INGESTION: call a physician immediately. Induce vomiting with water, keep also warm. Call in glass of water repeatedly. Induce vomiting with white of egg
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Data not available
5.7 Late Toxicity: Internal bleeding and kidney damage may develop
5.8 Vapor (Gas) Irritant Characteristics: Data not available
5.9 Liquid or Solid Irritant Characteristics: Data not available
5.10 Odor Threshold: Not pertinent

6 FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Smoke may contain toxic mercury compounds
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Not pertinent
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8. WATER POLLUTION

8.1 Aquatic Toxicity:
0.2 ppm 2 hr. minnow lethal fresh water
0.323 ppm * bivalve larvae lethal salt water
*Time period not specified
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Not pertinent
8.4 Food Chain Concentration Potential: Data not available

9 SELECTED MANUFACTURERS

Ventron Corporation
Chemicals Division
Congress Street
Beverly, Mass. 01915

10. SHIPPING INFORMATION

10.1 Grades of Purity: U.S.P. xxx
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

See Hazardous Materials Handbook, Guide 9

11

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Poisonous, Class B
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 252.1
13.3 Boiling Point at 1 atm: Not pertinent, sublimes at red heat
13.4 Freezing Point: Not pertinent, unfusible
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 5.7 at 20°C (solid)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

Continued on page 5 and 6

NOTES

MRC

MERCURIC CHLORIDE

Common Synonyms
Mercury bichloride
Corrosive mercuric chloride
Mercuric perchloride
Mercury (II) chloride
Calomel

Solid White

Sinks and reacts with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning: poison, water contaminant
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Calomel; Corrosive mercuric chloride; Corrosive sublimate; Mercuric bichloride; Mercuric chloride; Mercuric dichloride; Mercuric perchloride

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $HgCl_2$

3.4 **IMCO/United Nations Numerical Designation:** 9 / 1624

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White crystals

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Be Water approved airline respirator, personnel not appropriate except for escape

5.2 **Symptoms Following Exposure:** Effects of exposure to this compound are believed to be cumulative, irreversible in man for fatal within a few minutes, but death is generally preceded by several days. Acute poisoning has resulted from inhaling dust concentrations of [illegible] mg/m³ of air; symptoms include tightness and pain in chest, coughing and difficulty in breathing. Ingestion causes severe pain, vomiting and severe purging; as little as 0.3 gm can be fatal. Contact with eyes causes inflammation of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin.

5.3 **Treatment for Exposure:** Get prompt [illegible] if eyes exposed, flush for [illegible] minutes, determine the proper [illegible]. INHALATION remove victim to fresh air, get medical attention. INGESTION give egg white, milk or activated charcoal, induce vomiting, consult physician. EYES or SKIN wash with water for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, Rat LD_{50} = [illegible] mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Heat of fire may cause material to form fumes of mercuric chloride which are toxic

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.42 ppm 7 days Goldfish TL$_m$ fresh water
0.05 gm 48 hr punkinseed TL$_m$ salt water
0.2 ppm 48 hr oyster TL$_m$ sea water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Many organisms are capable of accumulating mercury from water. Bioconcentrating up to 10,000-fold

9 SELECTED MANUFACTURERS

1. Mallinckrodt Chemicals Works
   223 Westside Ave
   P O Box [illegible]
   Jersey City, N J [illegible]
2. J T Baker Chemical Co
   Phillipsburg, N J 08865
3. Gallard Schlesinger Chemical Mfg Co
   584 Mineola Ave
   Carle Place, N Y [illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Reagent, Analytical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

NA

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(continued on next page)

NOTES

MCN — MERCURIC CYANIDE

Common Synonyms
Cianurina
Mercury cyanide
Mercury (II) cyanide

Solid (crystals or powder) White

Sinks and mixes slowly with water

AVOID CONTACT WITH SOLID AND DUST KEEP FOIT AWAY
[illegible]
Stay [illegible] if possible
Isolate and restrict discharge [illegible]
[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes
[illegible]
IF EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]
CONVULSIONS [illegible]

Water Pollution

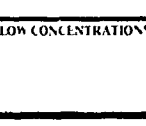
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cianurina, Mercury cyanide, Mercury (II) cyanide
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Hg(CN)_2$
3 4 **IMCO/United Nations Numerical Designation:** 6 1/1636

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Colorless or white
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Symptoms of both cyanide and mercury intoxication can occur. Acute poisoning has resulted from inhaling dust concentrations of 1.2 - 8.5 mg/m³ of air. symptoms include tightness and pain in chest, coughing, and difficulty in breathing. cyanide poisoning can cause anxiety, confusion, dizziness, and shortness of breath with possible unconsciousness, convulsions, and paralysis. breath may smell like bitter almonds. Ingestion causes necrosis, pain, vomiting, and severe purging, plus the above symptoms. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis. systemic poisoning can occur by absorption through skin.

5 3 **Treatment for Exposure:** *Act quickly, call physician.* INHALATION: if victim has stopped breathing, start artificial respiration immediately. using amyl nitrite pearls, administer amyl nitrite by inhalation for 15 - 30 seconds of every minute while sodium nitrite solution is being prepared. discontinue amyl nitrite and immediately inject intravenously 10 ml of a 3% solution of sodium nitrite (nonsterile if necessary) over a period of 2 - 4 min., without removing needle, infuse intravenously 50 ml of a 25% aqueous solution of sodium thiosulfate. injection should take about 10 min. (concentrations of 5 - 50% may be used, but keep total dose approx. 12 gm). Oxygen therapy may be helpful in combination with the above. INGESTION: *alimentary absorption is very rapid; action during first 10 - 15 min. determines prognosis.* Give egg whites, milk, or activated charcoal and induce vomiting. treat for cyanide poisoning as above. EYES: wash with water for 15 min.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.05 mg/m³ (as mercury)

5 5 **Short-Term Inhalation Limits:** Data not available

(Continued on page 4)

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Fumes from fire may contain toxic mercury and hydrogen cyanide
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Contact with any acidic material will form poisonous hydrogen cyanide gas which may collect in enclosed spaces
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 0.02 ppm/48 hr/daphnia magna/ TL_m/fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentrative up to 10 000 fold

9. SELECTED MANUFACTURERS

1 J T Baker Chemical Co
Phillipsburg, N J 08865

2 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford, Conn 06902

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous solid, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 252.63
13 3 **Boiling Point at 1 atm:** Not pertinent; (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 4.0 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6)

5 HEALTH HAZARDS (Cont'd.)

5 6 **Toxicity by Ingestion:** Grade 4 oral LD_{50} = 25 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Odorless

MID

MERCURIC IODIDE

Common Synonyms	Solid	Red	Odorless
Mercuric iodide, red Mercury biniodide	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator and rubber overclothing (including gloves)
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 448-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mercuric iodide, red; Mercury biniodide
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** HgI_2
3.4 **IMCO/United Nations Numerical Designation:** 6.1/6115

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Red
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5.2 **Symptoms Following Exposure:** *All forms of exposure to this compound are hazardous. Acute systemic mercurialism may be fatal within a few minutes; death by uremic poisoning is usually delayed 5–12 days.* Acute poisoning has resulted from inhaling dust concentrations of 1.2–8.5 mg/m³ of air; symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrosis, pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, get medical attention. INGESTION: *alimentary absorption is very rapid; action during first 10–15 min. determines prognosis.* Give egg whites, milk, or activated charcoal and induce vomiting, consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg/m³ (as mercury)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 40 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Fumes from fire may contain toxic mercury vapor
6.6 **Behavior in Fire.**
6.7 **Ignition Temperature.** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential.** Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold

9. SELECTED MANUFACTURERS

1. Mallinckrodt Chemical Works
223 Westside Ave
P O Box 384
Jersey City, N J 07303
2. J T Baker Chemical Co
Phillipsburg, N J 08865
3. Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 448-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 454.90
13.3 **Boiling Point at 1 atm:** 669°F = 354°C = 627°K
13.4 **Freezing Point:** 495°F = 257°C = 530°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 6 at 20°C (solid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

MNT	# MERCURIC NITRATE

Common Synonyms	Solid	White	Sharp odor
Mercury pernitrate Mercury (II) nitrate Mercury nitrate monohydrate	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear dust respirator and full body protective clothing
Stop discharge if possible
Isolate and restrict use of area
Notify local health and wildlife officials

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
If eyes are affected flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen
SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes
Flush affected area with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water milk and have victim vomit
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting do not give liquids

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant oxidizing material
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Mercuric nitrate monohydrate, Mercury (II) nitrate, Mercury pernitrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Hg(NO_3)_2 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1625

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White, colorless

4 3 **Odor:** Sharp odor of nitric acid

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** *Acute systemic poisoning may be fatal within a few minutes death by uremic poisoning is usually delayed 5 12 days* Acute poisoning has resulted from inhaling dust concentrations of 1 2 8 5 mg/m³ of air symptoms include tightness and pain in chest coughing, and difficulty in breathing Ingestion causes necrosis pain vomiting, and severe purging Contact with eyes causes ulceration of conjunctiva and cornea Contact with skin causes irritation and possible dermatitis, systemic poisoning can occur by absorption through skin

5 3 **Treatment for Exposure:** INHALATION remove to fresh air, get medical attention INGESTION *alimentary absorption is very rapid, action during first 10 15 min determines prognosis* Give egg whites, milk or activated charcoal and induce vomiting, consult physician EYES or SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 05 mg/m³ (as mercury)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 **Flash Point:** Not flammable but may intensify fire

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Vapors from fire may contain toxic mercury and oxides of nitrogen

6 6 **Behavior in Fire:** May increase intensity of fire if in contact with burning material

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Dissolves then forms cloudy acid solution The reaction is not hazardous

7 2 **Reactivity with Common Materials:** Solution will corrode most metals Solid in contact with wood or paper may cause fire

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush well with water rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Possible bioaccumulation problem Many organisms can accumulate mercury from water Bioconcentrates up to 10 000 fold

9. SELECTED MANUFACTURERS

1 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 384
Jersey City N J 07303

2 J T Baker Chemical Co
Phillipsburg N J 08865

3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Reagent 99 0%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 342 6

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 4 3 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

MOX

MERCURIC OXIDE

Common Synonyms
Mercuric oxide, red
Mercuric oxide yellow
Mercury oxide

Solid | Red orange or yellow | Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear dust respirator and rubber overclothing including gloves
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
If in eyes hold eyelids open flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea or vomiting

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify local health and wildlife
Notify operators of nearby water [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminan
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Mercuric oxide, red (Red precipitate) Mercuric oxide yellow (Yellow precipitate) Mercury oxide

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** HgO

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1641

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Red orange or yellow

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** *Acute systemic poisoning may be fatal within a few minutes death by uremic poisoning usually delayed 5 12 days* Acute poisoning has resulted from inhaling dust concentrations of 1 2 8 5 mg m³ of air symptoms include tightness and pain in chest coughing and difficulty in breathing Ingestion causes necrosis pain, vomiting and severe purging Contact with eyes causes ulceration of conjunctiva and cornea Contact with skin causes irritation and possible dermatitis systemic poisoning can occur by absorption through skin

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air, get medical attention INGESTION alimentary absorption is very rapid action during first 10 15 min determines prognosis Give egg whites milk or activated charcoal and induce vomiting, consult physician EYES flush with water for at least 15 min SKIN wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 05 mg m³ (as mercury)

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Cited 4 oral LD_{50} 18 mg kg (rat)

5 7 **Late Toxicity:** Cancerogen in rats

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:**

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable but may intensify fire

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Fumes from fire may contain poisonous mercury vapor

6 6 **Behavior in Fire** Decomposes at 500°C into mercury and oxygen, which can increase intensity of fire Solid changes color when hot

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** 0 29 ppm/48 hr marine fish TL_m

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential** Many organisms can accumulate mercury from water Bioconcentrative up to 10 000 fold

9. SELECTED MANUFACTURERS

1 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 384
Jersey City N J 07303

2 J T Baker Chemical Co
Phillipsburg N J 08865

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10. SHIPPING INFORMATION

10 1 **Grades or Purity:**
Red technical, reagent purified
Yellow technical NF reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 216 61

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 11 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MSF MERCURIC SULFIDE

Common Synonyms	Solid	Red or black	Odorless
Mercuric sulfide black Ethiops mineral Mercuric sulfide red Vermilion Artificial cinnabar Chinese red	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear dust respirator and rubber overclothing including gloves.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with water, foam, or sand.
Other extinguishing agents may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID.

DUST.
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.
If inhaled will cause coughing or difficult breathing.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, artificial respiration.
If breathing is difficult, give oxygen.

SOLID.
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Irritating to skin and eyes.
If swallowed will cause coughing, nausea and vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: water contaminant.
Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mercuric sulfide black (Ethiops mineral), Mercuric sulfide, red (Vermilion, Artificial cinnabar, Chinese red)

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** HgS

3.4 **IMCO/United Nations Numerical Designation:** 0.1/2024

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Red or black

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves.

5.2 **Symptoms Following Exposure:** Acute poisoning can result from inhaling dust concentrations of 1.2–8.5 mg m³ in air; symptoms include pain and tightness in chest, coughing, and difficulty in breathing. If ingested, toxicity depends on release of the Hg^{++} ion; chronic mercuric poisoning can cause kidney, mental, and nervous disturbances. Dust irritates eyes and frequently causes allergic dermatitis; absorption through skin can cause systemic poisoning.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, give artificial respiration if breathing has stopped. INGESTION: give egg whites, milk, or activated charcoal, induce vomiting, consult physician. EYES: flush with water. SKIN: wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg m³ (as Hg) (skin)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Central nervous system affects, tremors, psychological disturbances in humans

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, foam, sand

6.4 **Fire Extinguishing Agents Not to be Used:** Other agents may be ineffective

6.5 **Special Hazards of Combustion Products:** Smoke from fire contains poisonous mercuric vapor and irritating sulfur dioxide gas

6.6 **Behavior in Fire:** Changes color when hot. Decomposes at burning temperature. The black form may soften, and molten sulfur may flow out and burn.

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Many organisms can accumulate mercury from water; bioconcentrative up to 10,000 fold

9. SELECTED MANUFACTURERS

1 Ventron Corp
P O Box 159
Beverly, Mass 01915

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Merck & Co
Merck Chemical Division
126 East Lincoln Ave
Rahway, N J 07065

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** The black form may contain up to 40% free sulfur

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II

12. HAZARD CLASSIFICATION

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 232.7

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 8 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** 1,500 Btu lb (870 cal g, 3,600 J/g)

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

MRR

MERCUROUS CHLORIDE

Common Synonyms
Calomel
Mild mercurous chloride
Mercury monochloride
Mercury protochloride
Mercury subchloride

Solid | White | Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear dust respirator
Stop discharge if possible
Isolate and evacuate discharge area
Notify local health and pollution control agencies

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing
If in eyes hold eyelids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Restrict access
Shoal to be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Calomel, Mercurous monochloride, Mercury protochloride, Mercury subchloride, Mild mercurous chloride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** Hg_2Cl_2 or HgCl

3 4 **IMCO/United Nations Numerical Designation:** 6 1/2024

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Acute poisoning can result from inhaling dust concentrations of 1.2 - 8.5 mg/m³ in air, symptoms include pain and tightness in chest, cough, eg, and difficulty in breathing. Compound is an irritant, cathartic, or purgative agent. "Calomel sickness" a benign reaction with fever and rash, appears after about 1 week, seldom causes systemic poisoning. May be fatal if retained to 30 - 40 mg/kg. Contact with eyes causes mild irritation.

5 3 **Treatment for Exposure:** INHALATION remove to fresh air, give artificial respiration if breathing has stopped. INGESTION give egg whites, milk, or activated charcoal, induce vomiting, consult physician. EYES flush with water. SKIN wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg/m³ (as mercury)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 210 mg/kg (rat)

5 7 **Late Toxicity:** Central nervous system effects, tremors, psychological disturbances in humans

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Fumes from fire may contain toxic vapors of substance

6 6 **Behavior in Fire:** Vaporizes and escapes as a sublimate

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Many organisms can accumulate mercury from water. Bioconcentrative up to 10 000 fold

9 SELECTED MANUFACTURERS

1 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 384
Jersey City, N J 07303

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford, Conn 06902

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** NF Technical 99.6% Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

11

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 236.1

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 7.15 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

MRN	# MERCUROUS NITRATE

Common Synonyms
Mercury protonitrate
Mercurous nitrate monohydrate

Solid | White | Slight odor

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator and rubber overclothing, including gloves
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing

If on eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk at once to dilute stomach contents
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: poison, water contaminant, oxidizing material
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Mercurous nitrate monohydrate, Mercury protonitrate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Hg_2NO_3H_2O$
3 4 **IMCO/United Nations Numerical Designation:** 6 1, 1627

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** Slight odor of nitric acid

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** *Acute systemic poisoning may be fatal within a few minutes; death by uremic poisoning usually delayed 5 - 12 days.* Acute poisoning has resulted from inhaling dust concentrations of 1.2 - 8.5 mg/m³ of air. Symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrosis, pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis. Systemic poisoning can occur by absorption through skin.
5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, get medical attention. INGESTION: give egg whites, milk, or activated charcoal, induce vomiting, consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg/m³ (as mercury)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 297 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable, but may intensify fire
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Smoke from fire may contain toxic mercury vapor and oxides of nitrogen
6 6 **Behavior in Fire:** May increase intensity of fire
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Dissolves, then forms cloudy acid solution. The reaction is not hazardous
7 2 **Reactivity with Common Materials:** Solution may corrode most metals. Solid in contact with wood or paper may cause fire
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold

9 SELECTED MANUFACTURERS

1 J T Baker Chemical Co
Phillipsburg, N J 08865

2 Gallard-Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford, Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent, Purified
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizer
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 280.6
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 4.78 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
*13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

MCR	# MERCURY

Common Synonyms			
Quicksilver	Liquid	Silver	Odoriess
	Sinks in water		

Fire	Not flammable
Exposure	LIQUID Effects of exposure may be delayed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Quicksilver
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** Hg
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Silvery
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Avoid contact of liquid with skin For vapor use chemical cartridge (Hopcalite) respirator
5 2 **Symptoms Following Exposure:** No immediate symptoms As poisoning becomes established slight muscular tremor, loss of appetite, nausea, and diarrhea are observed Psyche, kidneys, and cardiovascular disturbances may occur
5 3 **Treatment for Exposure:** Consult a doctor
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 05 mg m³
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** No immediate toxicity
5 7 **Late Toxicity:** Development of mercury poisoning
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** None
5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0 5 1 ppm/48 hr/carassius ardium/TL m/ fresh water
0 29 ppm/48 hr/marine fish/TL m salt water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Mercury concentrates in liver and kidneys of ducks and geese to levels above FDA limit of 0 5 ppm Muscle tissue usually well below the limit

9. SELECTED MANUFACTURERS

1 Belmont Smelting and Refining Works, Inc
330 Belmont Ave
Brooklyn, N Y 11207

2 Engelhard Minerals and Chemical Corp
Philipp Bros Division
299 Park Ave
New York, N Y 10017

3 NL Industries
Goldsmith Division
900 W 18th St
Chicago, Ill 60608

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 200 59
13 3 **Boiling Point at 1 atm:**
674°F = 357°C = 630°K
13 4 **Freezing Point:**
−38 0°F = −38 9°C = 234 3°K
13 5 **Critical Temperature:**
2664°F = 1462°C = 1735°K
13 6 **Critical Pressure:**
23,300 psia = 1587 atm = 160 8 MN/m²
13 7 **Specific Gravity:** 13 55 at 20°C (liquid)
13 8 **Liquid Surface Tension:**
470 dynes/cm = 0 470 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:**
375 dynes/cm = 0 375 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 4)

NOTES

REVISED 1978

MSO — MESITYL OXIDE

Common Synonyms

4-methyl-3-pent-en-2-one
Isopropylideneacetone
Methyl isobutenyl ketone

Liquid | Colorless to light yellow | Strong peppermint or honey odor

Floats and mixes with water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause headache, dizziness or difficult breathing.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4:

Issue warning: water contaminant
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Isobutenyl methyl ketone, Isopropylideneacetone, Methyl isobutenyl ketone, 4-Methyl-3-pentene-2-one
3.2 **Coast Guard Compatibility Classification:** Ketone
3.3 **Chemical Formula:** $CH_3COCH{=}C(CH_3)_2$
3.4 **IMCO/United Nations Numerical Designation:** 9 / 1229

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to slightly yellow
4.3 **Odor:** Strong, peppermint, honey-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air pack or organic canister mask, rubber gloves, goggles
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, headache, dizziness, difficult breathing. Contact with liquid or concentrated vapor causes severe eye irritation. Liquid irritates skin. Ingestion causes irritation of mouth and stomach.
5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air and restore breathing, call physician. EYES: immediately flush with plenty of water for at least 15 min. SKIN: wash with water. INGESTION: give large amount of water, call physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm
5.5 **Short-Term Inhalation Limits:** 1 000 ppm for 60 min
5.6 **Toxicity by Ingestion:** Female 2 rat LD_{50} = 1 120 mg/kg (rats)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
5.10 **Odor Threshold:** 12 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 84°F O.C., 73°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 652°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 4.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017
2. Shell Chemical Company
Industrial Chemicals Division
P.O. Box 2463
Houston, Texas 77001
3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 97+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-2):

A.P.Q.T.T.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 98.2
13.3 **Boiling Point at 1 atm:** 266°F = 130°C = 403°K
13.4 **Freezing Point:** −51°F = −46°C = 227°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.853 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 22.9 dynes/cm = 0.0229 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.4
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 157 Btu/lb = 87 cal/g = 3.7 × 10⁵ J/kg
13.13 **Heat of Combustion:** −14 400 Btu/lb = −8 000 cal/g = −330 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 1 and 6)

NOTES

MCL

METHALLYL CHLORIDE

Common Synonyms

3-Chloro-2-methylpropene
gamma-Chloroisobutylene
beta-Methallyl chloride
beta-Methylallyl chloride

Liquid | Colorless to yellow | Sharp penetrating odor

Floats on water | Flammable, irritating vapor is produced

Fire

FLAMMABLE
Irritating gases may be produced when heated
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible] with dry chemicals, [illegible]
or may be ineffective [illegible]
exposed containers [illegible]

Exposure

[illegible] medical aid

VAPOR
Harmful if inhaled
[illegible]
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing promptly
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, give two glasses of water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR CONVULSING, DO NOTHING EXCEPT KEEP VICTIM WARM

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes
[illegible] aquatic life
[illegible] water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning: high flammability
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** gamma-Chloroisobutylene, 3-Chloro-2-methylpropene,beta Methallyl chloride, beta Methallyl chloride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_2=C(CH_3)CH_2Cl$

3.4 **NIOO/United Nations Numerical Designation:** [illegible] 1993

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to straw

4.3 **Odor:** Pungent, penetrating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister mask, goggles, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact of vapor or liquid with eyes causes irritation. Liquid irritates skin. Ingestion causes irritation of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. If breathing stops, give artificial respiration and oxygen. Subsequent treatment is symptomatic and supportive. EYES: flush with water for at least 15 min., get medical attention if exposure has been to liquid. SKIN: flush with water, get medical attention if skin is burned. INGESTION: induce vomiting and follow with gastric lavage, demulcents, and saline cathartics, get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Lake Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 14°F (-10°C)

6.2 **Flammable Limits in Air:** 2.2% - 9.3%

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene vapors may be formed

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. FMC Corporation
Industrial Chemical Division
633 Third Avenue
New York, N.Y. 10017

2. Propi, Inc
509 Madison Ave
New York, N.Y. 10022

3. Aldrich Chemical Co
940 West St. Paul Ave
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 95+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

A-T-U-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 90.55

13.3 **Boiling Point at 1 atm:** 162.0°F = 72.2°C = 345.4°K

13.4 **Freezing Point:** <-112°F = <-80°C = <193°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.920 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 32 dynes/cm = 0.032 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 3.12

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0893

13.12 **Latent Heat of Vaporization:** 160 Btu/lb = 89 cal/g = 3.7 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) -11,600 Btu/lb = -6,500 cal/g = -270 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 3 and 4)

NOTES

MTH — METHANE

Common Synonyms
Marsh gas
Natural gas

Liquid or gas — Colorless — Weak odor

Liquid floats and boils on water. Flammable visible vapor cloud is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
May explode if ignited in an enclosed area.

Exposure

VAPOR
Not irritating to eyes, nose or throat.
If inhaled, will cause dizziness, difficult breathing, and loss of consciousness.

LIQUID
Will cause frostbite.

Water Pollution

Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-2

Issue warning: high flammables
Restrict access
Evacuate area

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Marsh gas
3.2 **Coast Guard Compatibility Classification:** Paraffin
3.3 **Chemical Formula:** CH_4
3.4 **IMCO United Nations Numerical Designation:** 2.0 (9)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied gas
4.2 **Color:** Colorless
4.3 **Odor:** Weak odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus; chemical protective clothing if exposed to liquid
5.2 **Symptoms Following Exposure:** High concentrations may cause asphyxiation. No systemic effects even at 5% concentration in air
5.3 **Treatment for Exposure:** Remove to fresh air. Support respiration
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent (methane is an asphyxiant, and limiting factor is available oxygen)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless in brief contact because of rapid evaporation; however, prolonged contact may cause some frostbite
5.10 **Odor Threshold:** 2000 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** Flammable gas
6.2 **Flammable Limits in Air:** 5.0% – 15.0%
6.3 **Fire Extinguishing Agents:** Stop flow of gas
6.4 **Fire Extinguishing Agents Not to be Used:** Water
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 1004°F
6.8 **Electrical Hazard:** Class I Group D
6.9 **Burning Rate:** 12 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None
8.2 **Waterfowl Toxicity:** None
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Air Products and Chemicals, Inc.
Allentown, Pa. 18105

2 Phillips Petroleum Co.
Bartlesville, Okla. 74004

3 Union Carbide Corp.
Linde Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Research grade; pure grade
10.2 **Storage Temperature:** −260°F
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A B C D E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Hazard	0
Liquid or Solid Hazard	
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Mammalian Toxicity	0
Reactivity	
Other Chemicals	
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:** Not assigned

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 16.04
13.3 **Boiling Point at 1 atm:** −258.7°F = −161.5°C = 111.7°K
13.4 **Freezing Point:** −296.5°F = −182.5°C = 90.7°K
13.5 **Critical Temperature:** −116.5°F = −82.5°C = 190.7°K
13.6 **Critical Pressure:** 668 psia = 45.44 atm = 4.60 MN/m²
13.7 **Specific Gravity:** 0.422 at −260°F (liquid)
13.8 **Liquid Surface Tension:** 13 dynes/cm = 0.013 N/m at −260°F
13.9 **Liquid-Water Interfacial Tension:** 50 dynes/cm = 0.050 N/m at 68°F
13.10 **Vapor (Gas) Specific Gravity:** 0.55
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.31
13.12 **Latent Heat of Vaporization:** 219.2 Btu/lb = 122 cal/g = 510.9 J/g
13.13 **Heat of Combustion:** −23,875 Btu/lb = −13,264 cal/g = −55,510 J/g
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

NOTES

REVISED 1978

MSA	METHANEARSONIC ACID, SODIUM SALTS

Common Synonyms Disodium methane arsonate Monosodium methane arsonate MSMA DSMA	Solid or water solution. Colorless solid solution may be red or green. Odorless. Solid may float or sink in water; solid and solution mix with water.
[illegible]	
Fire	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED [illegible]
Exposure	[illegible] SOLID OR SOLUTION Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Treat as drinking [illegible] water contaminant.
Should be removed.
Chemical and physical treatment.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Disodium methanearsonate
Disodium methyl arsonate
DSMA
Monosodium methanearsonate
Monosodium methyl arsonate
MSMA

3.2 **Coast Guard Compatibility Classification:** Not applicable

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or water solution

4.2 **Color:** Colorless; solutions may contain red or green dyes

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing to prevent contact with skin. chemical goggles.

5.2 **Symptoms Following Exposure:** Subacute poisoning by arsenicals causes salty taste, burning in throat and stomach, and intestinal pain. Acute poisoning indicated by headache, vomiting, slight convulsions, paralysis. About 1 ounce to 1 pound must be taken to cause these symptoms.

5.3 **Treatment for Exposure:** INGESTION: cause vomiting, give water and repeat; give a saline cathartic such as sodium sulfate (NaSO4); wash with soap and water. EYES: wash out with water, consult physician if irritation remains.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2; LD50 = 700 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** Repeated contact may cause skin irritations

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic gases may be generated in fires.

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** None

7.2 **Reactivity with Common Materials:** None

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** >1000 ppm 48 hr bluegill & fish TL_m fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 The Ansul Co
Chemical Division
1 Stanton St
Marinette, Wis 54143

2 Diamond Shamrock Corp
Agricultural Division
1100 Superior Bldg
Cleveland, Ohio 44115

3 Vineland Chemical Co
P O Box 745
Vineland, N J 08360

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** The solid disodium salt (DSMA) contains water of crystallization. Salts are often shipped as solutions in water with use-concentrations up to about 30% solids.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or water solution

13.2 **Molecular Weight:** 162 (MSMA)
292 (DSMA hexahydrate)

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:** (MSMA) 243°F = 117°C = 390°K
(DSMA) 113°F = 45°C = 332°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** (DSMA) 1.0 at 20°C (solid)
(MSMA solutions) 1.4 [illegible] at 25°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

3. CHEMICAL DESIGNATIONS (Cont'd.)

3.3 **Chemical Formula:**
$CH_3AsO(ONa)_2$
$CH_3AsO(ONa)\cdot 6H_2O$

3.4 **NSCO United Nations Numerical Designation:** [illegible]

MOC

METHOXYCHLOR

Common Synonyms	Solid	White to light yellow	Mild fruity odor
2,2 Di(p-anisyl)-1,1,1 trichloroethane DMDT Methoxy DDT 2,2 Bis(p-methoxyphenyl)-1,1,1 trichloroethane	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear goggles and dust respirator
Call fire department
Stay upwind use water spray to knock down dust
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Extinguish with water dry chemicals foam or carbon dioxide

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
Move victim to fresh air
If in eyes hold eyelids open and flush with plenty of water
If breathing is difficult give oxygen
SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have vict m drink water or milk

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2,2 Bis(p-methoxyphenyl)-1,1,1 trichloroethane, 2,2-Di (p-anisyl) 1,1,1 trichloroethane, DMDT, Marlate 50, Methoxy DDT

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_{16}H_{15}Cl_3O_2$

3 4 **IMCO/United Nations Numerical Designation.** 6 1/1615

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Light cream, white to light yellow

4 3 **Odor:** Slightly fruity

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator if needed, gloves and goggles

5 2 **Symptoms Following Exposure:** Toxicity is relatively low Inhalation or ingestion causes generalized depression

5 3 **Treatment for Exposure:** EYES flush with water if irritated SKIN wash well with soap and water INGESTION consult physician

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 10 mg/m³

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 1, LD_{50} 5 to 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Burns only at high temperatures For liquid forms, see Kerosene

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Irritating and toxic hydrogen chloride gas may be formed in fire

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
0 035 ppm/96 hr/fathead/Tl m/fresh water
0 004 012 pp m/96 hr/marine crustacea/Tl m/salt water

8 2 **Waterfowl Toxicity** LD_{50} = 2,000 mg/kg

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 Ansul Co
1 Stanton Street
Marinette Wis 54143

2 Chemical Formulators Inc
P O Box 26
Nitro W Va 25143

3 E I duPont de Nemours & Co
Biochemicals Department
308 East Lancaster Ave
Wynnewood, Pa 19096

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Technical flake or chip 88% plus 12% isomers, Wettable powders 50 75% Dust concentrate 40% Emulsifiable concentrate (liquid) 25% solution in petroleum distillate

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not Listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 345 7

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point**
171–192°F = 77–89°C = 350–362°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity** 1 41 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

MTT

METHYL ACETATE

Common Synonyms

Acetic acid methyl ester

Liquid | Colorless | Mild sweet odor

Mixes with water. Flammable, irritating vapor is produced

Shut off source of leak if safe to do so
Stop discharge if possible. Keep people away
Stay upwind. Use water spray to reduce vapor
Isolate hazard area and deny entry
Notify local health and pollution control agencies

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemicals, alcohol foam, carbon dioxide
Water may be ineffective
Cool exposed containers with water

Exposure

Call for medical aid

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, or dizziness
Move victim to fresh air
If breathing has stopped, give artificial respiration
If bleeding, control bleeding

LIQUID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED do not induce VOMITING. Give plenty of water to drink
Get medical aid

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of downstream water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic acid, methyl ester
3.2 **Coast Guard Compatibility Classification:** Esters (13)
3.3 **Chemical Formula:** CH_3COOCH_3
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1231

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Slightly acrid sweet, fragrant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air mask or organic canister mask, goggles or face shield
5.2 **Symptoms Following Exposure:** (Very similar to those of methyl alcohol, which constitutes 20% of commercial grade.) Inhalation causes headache, fatigue, and drowsiness; high concentrations can produce central nervous system depression and optic nerve damage. Liquid irritates eyes and may cause defatting and cracking of skin. Ingestion causes headache, dizziness, drowsiness, fatigue, may cause severe eye damage
5.3 **Treatment for Exposure:** INHALATION: remove victim from affected area; if breathing has ceased, apply artificial respiration, call doctor. EYES: irrigate thoroughly with water for 15 min and call doctor. SKIN: wash affected area with water. INGESTION: get medical attention for methyl alcohol poisoning.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5.5 **Short-Term Inhalation Limits:** 400 ppm for 5 min
5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 3,700 mg/kg (rabbit)
5.7 **Late Toxicity:** Optic nerve may be damaged following overexposure to vapor or liquid
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 22°F O.C., 14°F C.C.
6.2 **Flammable Limits in Air:** 3.1% - 16%
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 935°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 3.7 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to form acetic acid and methyl alcohol; the reaction is not violent
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017
2. Monsanto Polymers & Petrochemicals Co.
800 North Lindbergh boulevard
St. Louis, Mo. 63166
3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 75-82% remainder is methyl alcohol
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q R-S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 74.1
13.3 **Boiling Point at 1 atm.**
134.6°F = 57.0°C = 330.2°K
13.4 **Freezing Point:**
−145.3°F = −98.5°C = 174.7°K
13.5 **Critical Temperature:**
452.7°F = 233.7°C = 506.9°K
13.6 **Critical Pressure:**
666 psia = 45.3 atm = 4.60 MN/m²
13.7 **Specific Gravity:** 0.927 at 20°C (liquid)
13.8 **Liquid Surface Tension:**
24 dynes/cm = 0.024 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** (est.)
30 dynes/cm = 0.030 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.1192
13.12 **Latent Heat of Vaporization:** 174 Btu/lb
= 97 cal/g = 4.1 × 10⁵ J/kg
13.13 **Heat of Combustion:** 9,260 Btu/lb
= 5,150 cal/g = 215 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MAP — METHYL ACETYLENE - PROPADIENE MIXTURE

Common Synonyms

Liquified compressed gas Colorless Garlic-like odor

*Floats and boils on water Flammable visible vapor cloud is produced

Shut off ignition sources Call fire department
Avoid contact with liquid Keep people away
Stop discharge if possible
Evacuate area of vessel of large discharge
Notify local health and pollution control agencies

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Let fire burn
Stop flow of gas if possible
Cool exposed containers and protect men in fire, shut off with water

Exposure

Call for medical aid

VAPOR
If inhaled will cause difficult breathing
Move victim to fresh air
If breathing is difficult give oxygen

LIQUID
Will cause frostbite
Flush affected areas with plenty of water
DO NOT RUB AFFECTED AREAS

Water Pollution

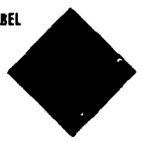
Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Allene methylacetylene mixture MAPP gas Methylacetylene allene mixture Propadiene methylacetylene mixture

3 2 **Coast Guard Compatibility Classification:** Olefin

3 3 **Chemical Formula:** $CH_3C{\equiv}CH + CH_2{=}C{=}CH$

3 4 **IMCO/United Nations Numerical Designation:** 2/1060

4. OBSERVABLE CHARACTERISTICS

4 **Physical State (as shipped):** Liquefied compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** Offensive, like acetylene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus for high concentrations safety goggles, protective gloves

5 2 **Symptoms Following Exposure:** Simple asphyxiant Toxicology of propadiene component not fully established Contact with liquid may burn eyes and cause frostbite of skin

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air, give artificial respiration if necessary EYES or SKIN treat burns caused by cold liquid

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1000 ppm

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Not pertinent

5 7 **Late Toxicity:** Lung irritation in rats and dogs

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** 100 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (flammable liquefied compressed gas)

6 2 **Flammable Limits in Air:** 3% - 11%

6 3 **Fire Extinguishing Agents:** Let fire burn shut off gas supply, cool adjacent exposures

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Containers may explode

6 7 **Ignition Temperature:** 850°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction, except forms explosive compounds in contact with alloys containing more than 67% copper at high pressures

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640

2 MAPP Products
100 Mountain Avenue
New Providence N J 07974

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 65% of a mixture of methylacetylene (85%) and propadiene (15%) plus 35% of a mixture of C_3 and C_4 saturated and unsaturated hydrocarbons

10 2 **Storage Temperature:** Ambient but less than 125°F

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-B-C-D-E-F-G

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 40 1

13 3 **Boiling Point at 1 atm:** −36 to −4°F = −38 to −20°C = 235 to 253°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 576 at 15°C (liquid)

13 8 **Liquid Surface Tension:** 18 dynes/cm = 0 018 N/m at −24°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 1 48

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.1686

13 12 **Latent Heat of Vaporization:** 227 Btu/lb = 126 cal/g = 5 28 × 10^5 J/kg

13 13 **Heat of Combustion:** −19 800 Btu/lb = −11,000 cal/g = −460 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

MAM METHYL ACRYLATE

Common Synonyms
Acrylic acid methyl ester
Methyl 2-propenoate

Watery liquid Colorless Sweet sharp odor

Floats and mixes slowly with water Flammable irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Containers may explode when heated
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes nose and throat
If inhaled will cause dizziness or difficult breathing

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning high flammability
Evacuate area

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Acrylic acid methyl ester
Methyl 2-propenoate

3 2 **Coast Guard Compatibility Classification:** Acrylate

3 3 **Chemical Formula:** $CH_2{=}CHCOOCH_3$

3 4 **IMCO/United Nations Numerical Designation:** 3 2/1919

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Characteristic acrylic sweet, sharp sharp fragrant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic cartridge for high vapor concentrations rubber gloves chemical goggles or face shield

5 2 **Symptoms Following Exposure:** May irritate skin, eyes respiratory system, and gastrointestinal tract Fumes cause tears

5 3 **Treatment for Exposure:** INHALATION remove to fresh air lay patient down keep him warm, administer artificial respiration if breathing has stopped administer oxygen SKIN OR EYES flush with plenty of water for 15 min, consult physician for eye exposure

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm

5 5 **Short-Term Inhalation Limits:** 25 ppm for 30 min

5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 500 to 5000 mg/kg (rabbit)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure may cause secondary burns on long exposure

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 27°F C C , 44°F O C

6 2 **Flammable Limits in Air:** 2 8% 25%

6 3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Irritating vapors are generated in fires

6 6 **Behavior in Fire:** May polymerize Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Heat may cause an explosive polymerization Strong ultraviolet light can also initiate polymerization

7 6 **Inhibitor of Polymerization:** Hydroquinone and its methyl ether, in presence of air

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Celanese Corp
Celanese Chemical Co Division
245 Park Ave
New York N Y 10017

2 Dow Badische Co
Freeport, Tex 77541

3 Rohm and Haas Co
Independence Mall West
Philadelphia, Pa 19105

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 9%

10 2 **Storage Temperature:** Ambient if material is inhibited, under 40°F if no inhibitor

10 3 **Inert Atmosphere:** Air MUST be present

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-T-U-V-W-Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 86 09

13 3 **Boiling Point at 1 atm:**
177°F = 80 6°C = 353 8°K

13 4 **Freezing Point:**
−105 7°F = −76 5°C = 196 7°K

13 5 **Critical Temperature:**
505°F = 263°C = 536°K

13 6 **Critical Pressure:**
630 psia = 43 atm = 4 3 MN/m²

13 7 **Specific Gravity:** 0 956 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
24 2 dynes/cm = 0 0242 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:**
(est) 30 dynes/cm = 0 03 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 3 0

13 11 **Ratio of Specific Heats of Vapor (Gas)**
1 102

13 12 **Latent Heat of Vaporization:**
150 Btu/lb = 90 cal/g = 3 8 × 10⁵ J/kg

13 13 **Heat of Combustion:** (est) −9900 Btu/lb
= −5500 cal/g = −230 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** −392 Btu/lb
= −218 cal/g = −9 13 × 10⁵ J/kg

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MAL

METHYL ALCOHOL

Common Synonyms
Methanol
Wood alcohol
Wood naphtha
Wood spirit
Pyroxylic spirit

Watery liquid | Colorless | Alcohol odor

Floats and mixes with water. Flammable, irritating vapor is produced

[illegible]

Fire

FLAMMABLE
Vapor may explode if ignited in an enclosed area
Flashback along vapor trail may occur
Extinguish with dry chemical, alcohol foam, carbon dioxide, sand
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim vomit
IF SWALLOWED and victim is UNCONSCIOUS OR CONVULSING, DO NOTHING except keep victim warm

Water Pollution

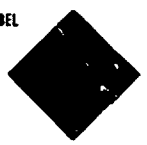
Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Colonial spirit, Wood alcohol, Columbian spirit, Wood naphtha, Methanol, Wood spirit

3 2 **Coast Guard Compatibility Classification:** Alcohol

3 3 **Chemical Formula:** CH_3OH

3 4 **IMCO/United Nations Numerical Designation:** 3 2/1230

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Faint alcohol, like ethyl alcohol, faintly sweet, characteristic pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved canister mask for high vapor concentrations; safety goggles; rubber gloves

5 2 **Symptoms Following Exposure:** Exposure to excessive vapor causes eye irritation, headache, fatigue and drowsiness. High concentrations can produce central nervous system depression and optic nerve damage. 50 000 ppm will probably cause death in 1 to 2 hrs. Can be absorbed through skin. Swallowing may cause death or eye damage.

5 3 **Treatment for Exposure:** Remove victim from exposure and apply artifical respiration if breathing has ceased. INGESTION: induce vomiting, then give 2 teaspoons of baking soda in glass of water, call a physician. SKIN OR EYES: flush with water for ≥5 min.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5 5 **Short-Term Inhalation Limits:** 260 mg/m^3 for 60 min

5 6 **Toxicity by Ingestion:** Grade 1, 5 to 15 g/kg (rat)

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** 100 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 54°F C C, 61°F O C

6 2 **Flammable Limits in Air:** 6 0% - 36 5%

6 3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Containers may explode

6 7 **Ignition Temperature:** 867°F

6 8 **Electrical Hazard:** Class I, Group D

6 9 **Burning Rate:** 1 7 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 250 ppm/11 hr/goldfish/died/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** 0 6 to 1 12 lb/lb in 5 days

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Borden Inc
Borden Chemical Division
Geismar, La 70734

2 Celanese Corp
Celanese Chemical Co Division
245 Park Ave
New York, N Y 10017

3 E I du Pont de Nemours & Co , Inc
Industrial and Biochemical Dept
Wilmington, Del 19898

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** CP, Crude ACS all 99 9%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester) or pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q R S

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 32 04

13 3 **Boiling Point at 1 atm:** 148 1°F = 64 5°C = 337 7°K

13 4 **Freezing Point:** −144 0°F = −97 8°C = 175 4°K

13 5 **Critical Temperature:** 464°F = 240°C = 513°K

13 6 **Critical Pressure.** 1142 0 psia = 77 7 atm = 7 87 MN/m^2

13 7 **Specific Gravity:** 0 792 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 1 1

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 254

13 12 **Latent Heat of Vaporization:** 473 0 Btu/lb = 262 Kcal/g = 11 00 × 10^5 J/kg

13 13 **Heat of Combustion:** −8419 Btu/lb = −4677 cal/g = −195 8 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (est) −9 Btu/lb = −5 cal/g = −0 2 × 10^5 J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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MTA

METHYLAMINE

Common Synonyms

Aminomethane
Monomethylamine
Mercurialin

Liquefied compressed gas Colorless Ammonia-like odor

Mixes with water and boils

[illegible] sources. Call fire department.
[illegible] with fog. Cool containers with flooding quantities of water. Apply water from as far distance as possible. Use water spray or fog for cooling exposed containers. Keep people away.
[illegible] Ventilate. Shut off gas supply if safe to do so. Water spray may be useful in minimizing or deflecting vapor cloud. Isolate area until gas has dispersed.
[illegible] Stop leak if safe to do so. Water spray may be useful in minimizing or deflecting vapor cloud. Isolate area until gas has dispersed.

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus [illegible]
Stop flow of gas if [illegible]
Cool exposed containers and protect [illegible] with water

Exposure

Call for medical aid

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
Move victim to fresh air
If breathing has stopped, administer resuscitation
If breathing is difficult, administer oxygen

LIQUID
Will burn skin and eyes
Remove clothing immediately
Flood affected parts with water
IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED, DO NOT INDUCE VOMITING. Give large amounts of water
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify owners of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, air contaminant, water contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Aminomethane
Mercurialin, Monomethylamine, anhydrous

3.2 **Coast Guard Compatibility Classification:** Amines (4)

3.3 **Chemical Formula.** CH_3NH_2

3.4 **IMCO/United Nations Numerical Designation.** Anhydrous 2.1061
Aqueous soln 3.1.1235

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Like ammonia, pungent, fishy, suffocating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face mask, rubber suit, apron, sleeves, and/or gloves, rubber or leather safety shoes, air line mask, positive pressure hose mask, self-contained breathing apparatus, or industrial canister type gas mask

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, followed by violent sneezing, burning sensation in throat, coughing, constriction of larynx, and difficulty in breathing, pulmonary congestion, edema of the lungs, and conjunctivitis. Contact with liquid burns skin and eyes. Severe exposure may cause blindness. Vapors may cause dermatitis. Ingestion causes burns of the mouth, throat, and esophagus.

5.3 **Treatment for Exposure:** Get medical attention for anyone overcome or injured by exposure to this compound. INHALATION: remove victim to fresh air at once; apply artificial respiration if breathing has stopped; administer oxygen. EYES: flush with water for at least 15 min. SKIN: flush with water; if skin is burned, do not use ointments or cover for 24 hours. INGESTION: do NOT induce vomiting; give large amount of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** 10 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50}: 0.5 to 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating, such that personnel will not usually tolerate moderate or high concentrations.

Continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (flammable liquefied compressed gas)

6.2 **Flammable Limits in Air:** 4.9 – 21

6.3 **Fire Extinguishing Agents:** Let gas fire burn, stop flow of gas. Extinguish solution fires with dry chemical, alcohol foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides may be formed

6.6 **Behavior in Fire.** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 806°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves completely

7.2 **Reactivity with Common Materials:** Corrosive to copper, copper alloys, zinc alloys, aluminum, and galvanized surfaces

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** > 10 and < 30 ppm 24 Hr Creek chub TL_m

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** 0.8% of theoretical in 14 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Commercial Solvents Corporation
Terre Haute, Ind. 47808
2. E. I. duPont de Nemours & Co., Inc.
Biochemicals Department
1007 Market Street
Wilmington, Del. 19898
3. Matheson Gas Products Co.
East Rutherford, N.J. 07073

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous 99.6+
Water solutions 30, 40, 50% by weight

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(see Hazard Assessment Handbook, CG-446-3)

A B C-K I M N

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicants	2
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 31.1

13.3 **Boiling Point at 1 atm:**
20.3°F = −6.5°C = 266.7°K

13.4 **Freezing Point:**
−134.5°F = −92.5°C = 180.7°K

13.5 **Critical Temperature:**
314°F = 157°C = 430°K

13.6 **Critical Pressure:**
1,080 psia = 73.6 atm = 7.47 MN/m²

13.7 **Specific Gravity:**
0.693 at −6.5°C (liquid)

13.8 **Liquid Surface Tension:**
10.59 dynes/cm = 0.0106 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.1

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.1936

13.12 **Latent Heat of Vaporization.** 555 Btu/lb
= 293 cal/g = 8.33 × 10⁵ J/kg

13.12 **Heat of Combustion:** −15,000 Btu/lb
= −8,340 cal/g = −34.9 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Data not available

13.16 **Heat of Polymerization.** Not pertinent

*Properties apply to anhydrous material

Continued on pages 3 and 4

5 HEALTH HAZARDS (Cont'd)

5.9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first-degree burns on short exposure and may cause second degree burns on long exposure

5.10 **Odor Threshold:** 0.021 ppm

MAC

METHYL AMYL ACETATE

Common Synonyms
4-Methyl-2-pentanol acetate
MAAc
4-Methyl-2-pentyl acetate
Hexyl acetate

Water: liquid | Colorless | Pleasant fruity odor

Floats on water

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hexyl acetate
MAAc
Methylisobutylcarbinyl acetate
4-Methyl-2-pentanol acetate
4-Methyl-2-pentyl acetate

3.2 **Coast Guard Compatibility Classification:** Ester

3.3 **Chemical Formula:** $CH_3COOCH(CH_3)CH_2CH(CH_3)_2$

(Continued on page 4)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Fruity, mild pleasant mild and nonresidual

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air pack, rubber gloves goggles

5.2 **Symptoms Following Exposure:** Headache dizziness nausea irritation to respiratory passages Irritates eyes

5.3 **Treatment for Exposure:** INHALATION remove from exposure immediately, call a physician if breathing is irregular or has stopped start resuscitation and administer oxygen EYE CONTACT flush with water for at least 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade I LD_{50} 5 to 15 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors [illegible] erate irritation such that personnel will find high concentrations unpleasant The [illegible] temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 113°F C.C., 110°F O.C.

6.2 **Flammable Limits in Air:** 0.9% - 5.7% (calc.)

6.3 **Fire Extinguishing Agents:** Alcohol foam carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 510°F (calc.)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 230 ppm/24 hr/brine shrimp/TL_m

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 20% of theoretical in 5 days/freshwater

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
Houston, Tex. 77001
2. Shell Chemical Co
Polymers Division
Houston, Tex. 77001
3. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 95 - 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

ATL

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	*
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 144.22

13.3 **Boiling Point at 1 atm:** 295.2°F = 146.2°C = 419.4°K

13.4 **Freezing Point:** −82.8°F = −63.8°C = 209.4°K

13.5 **Critical Temperature:** 606°F = 319°C = 592°K

13.6 **Critical Pressure:** 382 psia = 26 atm = 2.6 MN/m²

13.7 **Specific Gravity:** 0.860 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.046

13.12 **Latent Heat of Vaporization:** 225 Btu/lb = 125 cal/g = 5.23 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) −14,400 Btu/lb = −8,000 cal/g = −335 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

3. CHEMICAL DESIGNATIONS (Cont'd)

3.4 **IMCO/United Nations Numerical Designation:** UN 1233

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MAA METHYL AMYL ALCOHOL

Common Synonyms
Isobutylmethylcarbinol
4-Methyl-2-pentanol
Methylisobutylcarbinol

Oily liquid | Colorless | Mild alcohol odor

Floats on water. Irritating vapors is produced.

Stop discharge if possible. Keep people away.
Notify fire department.
Avoid [illegible] with liquid and vapor.
[illegible] Discharged material.
[illegible]

Fire

Combustible.
Extinguish with dry [illegible]
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or difficult breathing.
Harmful if skin is exposed.
[illegible]
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Wash affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, do not induce vomiting. Give large amounts of water.
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Isobutylmethylcarbinol, Isobutylmethylmethanol, MAOH, Methylisobutylcarbinol, 4-Methyl-2-pentanol, MIC

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula.** $(CH_3)_2CHCH_2CHOHCH_3$

3.4 **IMCO United Nations Numerical Designation:** 33, 2053

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp, mild and persistent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Air pack or organic canister mask, rubber gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. May cause anesthesia. Prolonged contact with liquid causes irritation and cracking of skin and irritates eyes.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give artificial respiration if needed, call a doctor. SKIN: flash with water. EYES: flash with water for at least 15 min., consult a doctor.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 120°-130°F O.C. (106°F C.C.)

6.2 **Flammable Limits in Air:** 1.0%-5.5%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 559°F (Calc.)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 4.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 370 ppm/24 hr/brine shrimp/TL_m

8.2 **Waterfowl Toxicity:**

8.3 **Biological Oxygen Demand (BOD)** 50% of theoretical in 5 days, freshwater

8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

1. Exxon Chemical Co.
   Houston, Tex. 77001
2. Shell Chemical Co.
   Industrial Chemical Division
   Houston, Tex. 77001
3. Union Carbide Corp.
   Chemicals and Plastics Division
   270 Park Ave.
   New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-Q-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 102.18

13.3 **Boiling Point at 1 atm:** 269.2°F = 131.8°C = 405°K

13.4 **Freezing Point:** <-130°F = <-90°C = <183°K

13.5 **Critical Temperature:** 556°F = 291°C = 564°K

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.807 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 22.8 dynes/cm = 0.0228 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.053

13.12 **Latent Heat of Vaporization:** 162 Btu/lb = 90.1 cal/g = 3.77 × 10⁵ J/kg

13.13 **Heat of Combustion:** -16,640 Btu/lb = -9240 cal/g = -387 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MAN

N-METHYLANILINE

Common Synonyms
Anilomethane
N-Methylaminobenzene
Methylaniline (mono)
Methylphenylamine

Liquid | Yellow to light brown | Chemical Odor

May float or sink in water

Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.
LIQUID.
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give anything; keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning; poison; water contaminant.
Restrict access.
Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Anilomethane, N-Methylaminobenzene, Methylaniline (mono), Methylphenylamine
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $C_7H_9NHCH_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Yellow to light brown
4 3 **Odor:** Moderate aniline type

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved respirator, rubber gloves, splash proof goggles.
5 2 **Symptoms Following Exposure:** Inhalation causes dizziness and headache. Ingestion causes blush discoloration to cartilage of lips, ear lobes, and innermost beds. Liquid irritates eyes. Absorption through skin produces same symptoms as ingestion.
5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air and call a physician at once; administer oxygen until physician arrives. INGESTION: give large amount of water; get medical attention at once. EYES or SKIN: flush with plenty of water for at least 15 min; if eyes are irritated, see physician. Remove any contaminated clothing.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 175°F C.C.
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 3.6 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 American Cyanamid Co
Bound Brook, N J 08805
2 Eastman Organic Chemicals
Rochester, N Y 14650
3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee, Wis 53233

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, Pure 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A T C-X-Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not Listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 107.2
13 3 **Boiling Point at 1 atm:** 384.6°F = 195.9°C = 469.1°K
13 4 **Freezing Point:** −71°F = −57°C = 216°K
13 5 **Critical Temperature:** 802°F = 428°C = 701°K
13 6 **Critical Pressure:** 784 psia = 51 atm = 5.20 MN/m
13 7 **Specific Gravity:** 0.989 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 39 dynes/cm = 0.0396 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** 3.70
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** 150 Btu/lb = 100 cal/g = 4.20 × 10⁵ J/kg
13 13 **Heat of Combustion:** −16,350 Btu/lb = −9,085 cal/g = −380.1 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

MTB METHYL BROMIDE

Common Synonyms
Bromomethane
Embafume

Liquefied gas Colorless Odorless to sweet odor

Sinks and boils in water. Poisonous vapor cloud is formed.
Boiling point is 39° F

Fire

Combustible
POISONOUS AND IRRITATING GASES ARE PRODUCED IN FIRE

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes.

LIQUID
Will burn skin and eyes.
Harmful if swallowed

Water Pollution

Not harmful to aquatic life
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison
Restrict access

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bromomethane
Embafume
M-B-C Fumigant
Monobromomethane

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:** CH_3Br

3.4 **IMCO/United Nations Numerical Designation:** 2.0/1062

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied gas

4.2 **Color:** Colorless

4.3 **Odor:** Relatively odorless sweet, chloroform-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, goggles

5.2 **Symptoms Following Exposure:** Inhalation of vapor causes lung congestion and pulmonary edema. Higher concentrations cause rapid narcosis and death. Contact with liquid irritates eyes and burns skin.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give artificial respiration if needed. SKIN OR EYES: flush with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 15 ppm

5.5 **Short-Term Inhalation Limits:** 20 ppm for 5 min

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.

5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** Practically not flammable

6.2 **Flammable Limits in Air:** 10% - 15%

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated when exposed to fire or heat.

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** 999° F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich. 48640

2 Great Lakes Chemical Corp
West Lafayette, Ind. 47906

3 Northwest Industries, Inc
Michigan Chemical Corp
351 E. Ohio St.
Chicago, Ill. 60611

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial not less than 99.5%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-B-C-I-J

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	4
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15° C and 1 atm:** Gas

13.2 **Molecular Weight:** 94.95

13.3 **Boiling Point at 1 atm:** 38.5° F = 3.6° C = 276.8° K

13.4 **Freezing Point:** −135° F = −93° C = 180° K

13.5 **Critical Temperature:** 376° F = 191° C = 464° K

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.68 at 20° C (liquid)

13.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 15° C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 3.3

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.247

13.12 **Latent Heat of Vaporization:** 108 Btu/lb = 59.7 cal/g = 2.50 × 10⁵ J/kg

13.13 **Heat of Combustion:** −3183 Btu/lb = −1771 cal/g = −74.15 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MBK — METHYL n-BUTYL KETONE

Common Synonyms
2-Hexanone
n-Butyl methyl ketone

Liquid | Clear | Disagreeable Odor

Floats and mixes with water

[illegible]

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled

[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Personnel Protection Handbook CG-446-4)

Issue warning - air contaminant, water contaminant, high flammability
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Butyl methyl ketone, 2-Hexanone
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $CH_3(CH_2)_3COCH_3$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Clear
4.3 **Odor:** Characteristic strong disagreeable odor resembling acetone

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles or face shield, approved respirator (for major spills)

5.2 **Symptoms Following Exposure:** Inhalation of high concentrations of vapor may result in narcosis; peripheral neuropathy may develop. Ingestion of large amounts may cause severe systemic injury. Contact with eyes causes mild to moderate irritation. Liquid irritates skin; prolonged or repeated contact may cause defatting of the skin with resultant dermatitis.

5.3 **Treatment for Exposure:** INHALATION: move to uncontaminated atmosphere and treat symptomatically; alert physician to possible development of peripheral neuropathy. INGESTION: give large amount of water and induce vomiting. EYES: irrigate immediately and thoroughly with water for 15 min. and get medical attention. SKIN: flush exposed areas thoroughly with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 2,590 mg/kg (rat)

5.7 **Late Toxicity:** Peripheral neuropathy in experimental animals and man; disease of motor and of sensory nerves

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 83°F (C.C.) 77°F (C.C.)
6.2 **Flammable Limits in Air:** 1.2% x 8.0%
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** 795°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 5.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Chemical Products, Inc., Kingsport, Tenn. 37662
2. Aldrich Chemical Co., 940 W. Saint Paul Ave., Milwaukee, Wis. 53233
3. Pfaltz and Bauer, Inc., 375 Fairfield Ave., Stamford, Conn. 06902

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial 95% Pure, 99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arresters

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

NFQ1x

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 100.16
13.3 **Boiling Point at 1 atm:** 261°F = 127°C = 400°K
13.4 **Freezing Point:** -70.4°F = -56.9°C = 216.3°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.815 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 25.49 dynes/cm = 0.02549 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 9.73 dynes/cm = 0.00973 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 155 Btu/lb = 92 cal/g = 3.8 x 10^5 J/kg
13.13 **Heat of Combustion:** -16,100 Btu/lb = -8,940 cal/g = -37.4 x 10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on reverse side)

NOTES

MTC

METHYL CHLORIDE

Common Synonyms
Chloromethane

Liquefied compressed gas Colorless Ether or sweet odor

Floats and boils on water. Flammable visible vapor cloud is formed.

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Not irritating to eyes, nose or throat.
If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness.

LIQUID
Will cause frostbite.

Water Pollution

Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning by flammability, air contaminant.
Restrict access.
Evacuate area.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Arcton, Chloromethane

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:** CH_3Cl

3.4 **IMCO, United Nations Numerical Designation:** 2.0 1063

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied gas

4.2 **Color:** Colorless

4.3 **Odor:** Faint sweet, non irritating, faint ether like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved canister mask, leather or vinyl gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Inhalation causes nausea, vomiting, weakness, headache, emotional disturbances, high concentrations cause mental confusion, eye disturbances, muscular tremors, cyanosis, convulsions. Contact of liquid with skin may cause frostbite.

5.3 **Treatment for Exposure:** Remove to fresh air. Call a doctor and have patient hospitalized for observation of unusually developing symptoms.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm.

5.5 **Short-Term Inhalation Limits:** 100 ppm for 5 min.

5.6 **Toxicity by Ingestion:** Not pertinent.

5.7 **Late Toxicity:** None.

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin because it evaporates quickly. May cause frostbite.

5.10 **Odor Threshold:** Data not available.

6. FIRE HAZARDS

6.1 **Flash Point:** < 32°F (< 0°C)

6.2 **Flammable Limits in Air:** 8.1% - 17.2%

6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide. Stop flow of gas.

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.

6.5 **Special Hazards of Combustion Products:** Toxic acids and gases are generated in fires.

6.6 **Behavior in Fire:** Container may explode.

6.7 **Ignition Temperature:** 1170°F (632°C)

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** 2.2 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Reacts with zinc, aluminum, magnesium, and their alloys, reaction is not violent.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Ancon Chemical Corp.
   Westlake, La. 70669
2. Dow Chemical Co.
   Midland, Mich. 48640
3. Ethyl Corp.
   Industrial Chemicals Divsn.
   451 Florida St.
   Baton Rouge, La. 70801

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical grade
"Arctic" refrigerant grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-B-C-D-E-F-G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	2
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 50.49

13.3 **Boiling Point at 1 atm:** -11.6°F = -24.2°C = 249°K

13.4 **Freezing Point:** -143.9°F = -97.7°C = 175.5°K

13.5 **Critical Temperature:** 290.5°F = 143.6°C = 416.8°K

13.6 **Critical Pressure:** 969 psia = 65.9 atm = 6.68 MN/m²

13.7 **Specific Gravity:** 0.99° at -24°C (liquid)

13.8 **Liquid Surface Tension:** 16.2 dynes/cm = 0.0162 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 24°C

13.10 **Vapor (Gas) Specific Gravity:** 1.7

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.249

13.12 **Latent Heat of Vaporization:** 182.3 Btu/lb = 101 cal/g = 4.241×10^5 J/kg

13.13 **Heat of Combustion:** -4290 Btu/lb = -2970 cal/g = -12.43×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent.

13.15 **Heat of Solution:** Not pertinent.

13.16 **Heat of Polymerization:** Not pertinent.

Continued on pages 3 and 4

NOTES

REVISED 1978

METHYL CHLOROFORMATE

Common Synonyms

Chloroformic acid methyl ester
Methyl chlorocarbonate

Liquid | Colorless to light yellow | Unpleasant odor

Sinks and reacts in water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause difficult breathing.

LIQUID
POISONOUS IF SWALLOWED.
Will burn skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

Issue warning. Corrosive fumes.
High flammability.
Restrict access.
Dike near and flush.

2. LABELS





3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chloroformic acid, methyl ester; monochloroformic acid, methyl ester; Methyl chlorocarbonate

3.2 **Coast Guard Commodity Classification:** Not applicable

3.3 **Chemical Formula:** CH_3OCOCl

3.4 **IMCO/United Nations Numerical Designation:** 2.2 1238

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to light yellow

4.3 **Odor:** Acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Avoid contact. Wear self-contained breathing apparatus, goggles or face shield, plastic gloves.

5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates nose and throat and can cause delayed pulmonary edema. Liquid irritates eyes and causes severe skin burns. Fatal if allowed to remain. Ingestion causes burns, stomach and intestinal.

5.3 **Treatment for Exposure:** INHALATION: Remove victim from exposure, if breathing stops, administer artificial respiration, call physician. EYES: Irrigate with copious amounts of water for at least 15 min., call physician if needed. SKIN: Flush with water for 15 min, get medical attention for burns. INGESTION: Never give anything by mouth to an unconscious victim, get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, Oral LD_{50} 50 mg/kg (rats)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 50°F (OC) 72°F (CC)

6.2 **Flammable Limits in Air:** 11.2 vol %

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene may be formed

6.6 **Behavior in Fire:** Vapor is heavier than air and can travel a considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 2.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly evolving hydrochloric acid. Reaction can be hazardous if water is hot

7.2 **Reactivity with Common Materials:** Corrosive to most metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, then with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Chemetron Corporation
Chemicals Group
211 Seventh Avenue
New York, N.Y. 10011

2. Air Products and Chemicals, Inc.
Specialty Chemicals Department
P.O. Box 538
Allentown, Pa. 18105

3. Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 97+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-2)

NOWS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 94.5

13.3 **Boiling Point at 1 atm:** 160°F = 71°C = 344°K

13.4 **Freezing Point:** -4°F = -21°C = 252°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.22 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 3.25

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1544

13.12 **Latent Heat of Vaporization:** (est.) 151 Btu/lb = 85 cal/g = 3.6 x 10^5 J/kg

13.13 **Heat of Combustion:** -5.9 x 10^3 Btu/lb = -3.3 x 10^3 cal/g = -13.8 x 10^6 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

MCT — METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL

Common Synonyms Combustion Improver C-12	Liquid Sinks in water	Yellow to dark orange	Faint pleasant odor

AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY.
Wear rubber [illegible] than [illegible]
[illegible]
[illegible]
[illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE.
[illegible]
Extinguish with [illegible]

Exposure

CALL FOR MEDICAL AID
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
If swallowed will cause loss of consciousness
[illegible]
[illegible]
IF SWALLOWED and victim is CONSCIOUS [illegible]
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Insect warning [illegible], water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Combustion Improver C-12
3.2 **Coast Guard Compatibility Classification:** To be developed
3.3 **Chemical Formula:** $C_9H_7O_3Mn$
3.4 **IMCO/United Nations Numerical Designation:** 9.17

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Straw to dark orange
4.3 **Odor:** Faint pleasant herbaceous

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister mask, rubber gloves and apron, protective goggles or face shield
5.2 **Symptoms Following Exposure:** Inhalation, ingestion, or skin contact affect central nervous system causing convulsions, respiratory depression, cyanosis, and coma. Liquid irritates eyes
5.3 **Treatment for Exposure:** Get medical attention following all exposures to this compound
INHALATION: remove victim from exposure, administer artificial respiration if necessary
EYES: flush with plenty of water for at least 15 min. SKIN: wash well with soap and water
INGESTION: induce vomiting
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm (as Mn)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 21 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** > 200°F (C.C.)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, water spray, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic vapors are formed in fire
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Data not available
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Ethyl Corporation
Industrial Chemicals Division
Ethyl Tower 451 Florida
Baton Rouge, La. 70801
2. Veratron Corporation
Alfa Products
Box 159
Beverly, Mass. 01915
3. PCR Inc.
P.O. Box 1466
Gainesville, Fla. 32602

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99.8%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A.V.1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 218
13.3 **Boiling Point at 1 atm:** 451°F = 233°C = 506°K
13.4 **Freezing Point:** 34°F = 1°C = 274°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.38 at 20°C (solid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

MCP METHYL CYCLOPENTANE

Common Synonyms

Cyclopentane, methyl

Liquid | Colorless | Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced.

Shut off ignition sources. Call fire department.
Stop discharge if possible. Keep people away.
Isolate and remove leaked material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemicals, foam, carbon dioxide.
Water may be ineffective.
Cool exposed containers with water.

Exposure

Call for medical aid.

VAPOR

If inhaled will cause dizziness or difficult breathing.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning: high flammability
Evacuate area
Mechanical containment
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cyclopentane, methyl
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula.** C_6H_{12}
3.4 **IMCO/United Nations Numerical Designation:** 1.1/1241

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, goggles or face shield, rubber gloves.

5.2 **Symptoms Following Exposure:** Inhalation causes dizziness, nausea and vomiting; concentrated vapor may cause unconsciousness and collapse. Liquid causes irritation of eyes and mild irritation of skin if allowed to remain. Ingestion causes irritation of stomach. Aspiration causes severe lung irritation, rapidly developing pulmonary edema, and central nervous system excitement followed by depression.

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure; if breathing has stopped, begin artificial respiration; call physician. EYES: flush with water for 15 min; call physician. SKIN: flush well with water, then wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. ASPIRATION: enforce bed rest, give oxygen, get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** 300 ppm for 60 min

5.6 **Toxicity by Ingestion:** Grade 1: LD_{50} 5 to 15 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is nonirritating to eyes and throat.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.

5.10 **Odor Threshold:** Data not available.

6. FIRE HAZARDS

6.1 **Flash Point:** <0°F C.C.
6.2 **Flammable Limits in Air:** 1.1% - 8.7% (approx.)
6.3 **Fire Extinguishing Agents.** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 624°F
6.8 **Electrical Hazard.** Data not available
6.9 **Burning Rate:** 7.1 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville, Okla. 74004

2 Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

3 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Research 99.94%, Pure 99.5%, Technical 96.5%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A-T-U-V-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 84.2
13.3 **Boiling Point at 1 atm:** 161.3°F = 71.8°C = 345.0°K
13.4 **Freezing Point.** −224°F = −142°C = 131°K
13.5 **Critical Temperature.** 499.3°F = 259.6°C = 532.8°K
13.6 **Critical Pressure:** 550 psia = 37.4 atm = 3.79 MN/m²
13.7 **Specific Gravity:** 0.749 at 20°C (liquid)
13.8 **Liquid Surface Tension.** 21.60 dynes/cm = 0.0216 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension.** (est.) 35 dynes/cm = 0.035 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 2.9
13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.0834
13.12 **Latent Heat of Vaporization:** 162 Btu/lb = 90 cal/g = 3.8 × 10⁵ J/kg
13.13 **Heat of Combustion:** (liquid) −18 900 Btu/lb = −10 500 cal/g = −440 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MCS — METHYLDICHLOROSILANE

Common Synonyms	Liquid	Colorless	Sharp irritating odor
	Reacts violently with water. Irritating gas is produced on contact with water.		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources. Call fire department.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemicals or carbon dioxide.
DO NOT USE WATER OR FOAM ON FIRE.
DO NOT USE WATER OR FOAM ON ADJACENT FIRES.

Exposure

Call for medical aid.

VAPOR

Irritating to eyes, nose and throat.
If inhaled will cause difficult breathing.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

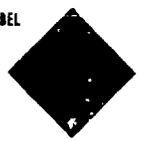
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.
Disperse and flush with care.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** CH_3SiHCl_2

3.4 **IMCO/United Nations Numerical Designation.** 3.2/1242

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Acrid, sharp, hydrochloric acid like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protective clothing, acid vapor type respirators, protection, rubber gloves, chemical worker's goggles, other protective equipment as necessary to protect skin and eyes.

5.2 **Symptoms Following Exposure.** Inhalation causes irritation of respiratory tract; heavy exposure can cause pulmonary edema. Contact of liquid with skin or eyes causes severe burns. Ingestion causes burns of mouth and stomach.

5.3 **Treatment for Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove victim from exposure; if breathing has stopped, begin artificial respiration. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting, give large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 3. LD_{50} 50 to 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** −14°F O.C.

6.2 **Flammable Limits in Air:** 6% - 55%

6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam

6.5 **Special Hazards of Combustion Products.** Toxic hydrogen chloride and phosgene gases may be formed.

6.6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires will generate irritating hydrogen chloride gas.

6.7 **Ignition Temperature:** > 600°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 30 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride (hydrochloric acid)

7.2 **Reactivity with Common Materials.** Reacts with surface moisture to evolve hydrogen chloride which is corrosive to common metals.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water and rinse with sodium bicarbonate or lime solution.

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N. Y. 10017

2 Dow Corning Corporation
P. O. Box 592
Midland, Mich. 48640

3 PCR, Inc.
P. O. Box 1466
Gainesville, Fla. 32602

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 97%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A.O.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	3
Self-Reaction	1

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 115

13.3 **Boiling Point at 1 atm.** 106.7°F = 41.5°C = 314.7°K

13.4 **Freezing Point:** −135°F = −93°C = 180°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.11 at 25°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 4

13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13.12 **Latent Heat of Vaporization.** 106 Btu/lb = 59 cal/g = 2.5×10^5 J/kg

13.13 **Heat of Combustion** (est.) −4 700 Btu/lb = −2 600 cal/g = -110×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

MEK — METHYL ETHYL KETONE

Common Synonyms
MEK
2 Butanone
Ethyl methyl ketone

Liquid | Colorless | Sweet odor

Floats and mixes with water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapors.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
Will burn eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

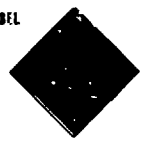
Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2 Butanone; Ethyl methyl ketone; MEK
3 2 **Coast Guard Compatibility Classification:** Ketone
3 3 **Chemical Formula:** $CH_3COCH_2CH_3$
3 4 **IMCO/United Nations Numerical Designation.** 3 2/1193

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Like acetone, pleasant, pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic canister or air pack, plastic gloves, goggles or face shield
5 2 **Symptoms Following Exposure:** Liquid causes eye burn. Vapor irritates eyes, nose, and throat can cause headache, dizziness, nausea, weakness, and loss of consciousness.
5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES: wash with plenty of water for at least 15 min. and call physician.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5 5 **Short-Term Inhalation Limits:** 290 mg/m^3 for 60 min
5 6 **Toxicity by Ingestion.** Grade 2, 0.5 to 5 g/kg (rat)
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5 10 **Odor Threshold:** 10 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 20°F C.C., 22°F O.C.
6 2 **Flammable Limits in Air:** 1.8% - 11.5%
6 3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 961°F
6 8 **Electrical Hazard:** Class I, Group D
6 9 **Burning Rate:** 4.1 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** 5640 mg/l/48 hr/Bluegill/11 m/fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** 214% 5 days
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Celanese Corp.
Celanese Chemical Co. Division
245 Park Ave.
New York, N.Y. 10017
2 Exxon Chemical Co.
Houston, Tex. 77001
3 Shell Chemical Co.
Industrial Chemicals Division
Houston, Tex. 77001

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99.5+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open flame arrester/vacuum pressure vacuum

11 HAZARD ASSESSMENT CODE

(Hazard Assessment Handbook CG 446-3)

A-P-Q R-S

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3 *
Health	
Vapor Irritant	
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 72.11
13 3 **Boiling Point at 1 atm:** 175.3°F = 79.6°C = 352.8°K
13 4 **Freezing Point:** −123.3°F = −86.3°C = 186.9°K
13 5 **Critical Temperature:** 504.5°F = 262.5°C = 535.7°K
13 6 **Critical Pressure:** 503 psia = 41.0 atm = 4.15 MN/m^2
13 7 **Specific Gravity:** 0.806 at 20°C (liquid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 2.5
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.075
13 12 **Latent Heat of Vaporization:** 191 Btu/lb = 106 cal/g = 4.44 × 10^5 J/kg
13 13 **Heat of Combustion:** −13 480 Btu/lb = −7491 cal/g = −313.6 × 10^5 J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = −0.2 × 10^5 J/kg
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MEP — METHYLETHYLPYRIDINE

Common Synonyms
5-Ethyl 2-methyl pyridine
5-Ethyl-2-picoline
MEP

Liquid | Colorless | Sharp odor

Floats on water

Avoid contact with liquid. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber overclothing.
Stop discharge if possible.
Collect for reuse or disposal.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible

Wear goggles, self-contained breathing apparatus and rubber overclothing (including gauntlets).
Extinguish with water, dry chemical, alcohol foam, carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Mechanical containment
should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Aldehyde-collidine
Aldehydine
5-Ethyl 2-methylpyridine
5-Ethyl 2-picoline
MEP

3.2 **Coast Guard Compatibility Classification:** Aromatic amine

3.3 **Chemical Formula.** $C_8H_{11}N$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp penetrating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask for high vapor concentrations, plastic gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Breathing of vapors will cause vomiting and chest discomfort. Contact with liquid causes skin and eye burns.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give oxygen if breathing is difficult, call a physician. SKIN OR EYES: immediately flush with plenty of water for at least 15 min., get medical care for eyes.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1700 ppm 3.7 hr lethal(rat)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD$_{50}$ 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 155°F O.C.

6.2 **Flammable Limits in Air:** 1.1% - 6.6%

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 939°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, neutralize with dilute acetic acid

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** (theor.) 4.4 lb/lb, 5 days 56.6%, 20 days, 0.12-2.14 lb/lb 5 days

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Lonza Inc
22-10 Route 208
Fairlawn, N.J. 07410

2. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.9%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-Q-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive Material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 121.18

13.3 **Boiling Point at 1 atm.** 352°F = 178°C = 451°K

13.4 **Freezing Point:** −94.5°F = −70.3°C = 202.9°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.922 at 20°C (liquid)

13.8 **Liquid Surface Tension.** 36 dynes/cm = 0.036 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MTF METHYL FORMAL

Common Synonyms
Methylal
Methylene dimethyl ether
Dimethoxymethane
Dimethoxymethane
Formaldehyde dimethylacetal

Liquid | Colorless | Mild sweet odor

Mixes with water. Flammable, irritating vapor is produced.

Shut off ignition sources. Call fire department.
Stop discharge if possible. Keep people away.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Irritating gases may be produced when heated.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Extinguish with dry chemicals, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.

Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
If IN EYES, hold eyelids open and flush with plenty of water.
If SWALLOWED and victim is CONSCIOUS, having victim drink water, milk and have victim induce vomiting.
If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
water contaminant
Restrict access.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dimethoxymethane, Dimethylformal, Formaldehyde dimethylacetal, Methylal, Methylene dimethyl ether

3 2 **Coast Guard Compatibility Classification:** Ether

3 3 **Chemical Formula:** $CH_2(OCH_3)_2$

3 4 **IMCO/United Nations Numerical Designation:** 3 1/1234

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild ethereal chloroform like

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus or all purpose canister mask, rubber gloves, chemical safety goggles, impervious apron and boots.

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory system and depression of central nervous system. Liquid causes irritation of eyes and will irritate skin if allowed to remain. Ingestion causes depression of central nervous system.

5 3 **Treatment for Exposure:** INHALATION: remove victim from contaminated area and administer artificial respiration and oxygen if necessary. EYES: flush with plenty of water, get medical attention. SKIN: flush with plenty of water. INGESTION: induce vomiting, administer gastric lavage and saline cathartics, subsequent treatment is symptomatic and supportive.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1: 1 Dose 5 to 15 g/kg

5 7 **Late Toxicity:** Liver and kidney injury may follow high exposures.

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 0°F, O C.

6 2 **Flammable Limits in Air:** 1 6% - 17 6%

6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Irritating formaldehyde gas may be present in smoke

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 459°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 5 5 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Celanese Chemical Company
245 Park Avenue
New York, N Y 10017

2 Aldrich Chemical Co
940 West Saint Paul Ave
Milwaukee, Wis 53233

3 Eastman Kodak Co
Eastman Organic Chemicals
Rochester, N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 97+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P-Q R S

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 76 1

13 3 **Boiling Point at 1 atm:** 106°F = 42°C = 315°K

13 4 **Freezing Point:** −157°F = −105°C = 168°K

13 5 **Critical Temperature:** 419°F = 215°C = 488°K

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 861 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 21 1 dynes/cm = 0 0211 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 2 6

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1,0888

13 12 **Latent Heat of Vaporization:** 161 5 Btu/lb = 89 8 cal/g = 3 76 × 10⁵ J/kg

13 13 **Heat of Combustion:** −10,970 Btu/lb = −6 100 cal/g = −255 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

MFM METHYL FORMATE

Common Synonyms

Formic acid, methyl ester

Liquid | Colorless | Pleasant odor

Mixes with water. Flammable, irritating vapor is produced. Boiling point is 88° F

Shut off ignition sources. Call fire department.
[illegible] possible. Keep people away.
[illegible] spilled material.
[illegible] pollution [illegible] authorities.

Fire

FLAMMABLE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
[illegible] with dry chemicals, [illegible] foam.
Water may be ineffective for fire.
[illegible] containers with water.

Exposure

Call for medical aid.

VAPOR

Irritating to eyes, nose and throat.
Harmful if inhaled.
[illegible]
[illegible]
[illegible]

LIQUID

Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, [illegible]
[illegible]
IF SWALLOWED and victim is UNCONSCIOUS OR HAS NO CONVULSIONS, induce vomiting.
[illegible]

Water Pollution

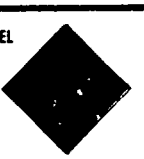
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
[illegible]
Notify [illegible] if [illegible] enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, water contaminant
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Formic acid, methyl ester
3 2 **Coast Guard Compatibility Classification:** Esters (13)
3 3 **Chemical Formula:** HCOOCH3
3 4 **IMCO/United Nations Numerical Designation:** 3 1/1243

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Pleasant, agreeable

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or safety glasses; self-contained breathing apparatus; rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane. Prolonged inhalation can produce narcosis and central nervous symptoms, including some temporary visual disturbance. Contact with liquid irritates eyes and may irritate skin if allowed to remain. Ingestion causes irritation of mouth and stomach and central nervous system depression including visual disturbances.
5 3 **Treatment for Exposure:** INHALATION: move to fresh air and rest; if pulmonary edema develops, administer oxygen; call physician. EYES: irrigate with water for 15 min. SKIN: wash thoroughly with soap and water. INGESTION: do NOT induce vomiting; get medical attention.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 1: LD_{50} 5 to 15 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** −26°F C.C.
6 2 **Flammable Limits in Air:** [illegible]% 22.7%
6 3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6 7 **Ignition Temperature:** 853°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 2.6 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Slow reaction to form formic acid and methyl alcohol; reaction is not hazardous
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 E I duPont de Nemours & Co., Inc.
Biochemicals Department
1007 Market Street
Wilmington, Del. 19898

2 Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, Wis. 53233

3 Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical, practical and spectro grades; all 97.5+%
10 2 **Storage Temperature:** <85°F
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-R-S

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 60.1
13 3 **Boiling Point at 1 atm:** 89.2°F = 31.8°C = 305°K
13 4 **Freezing Point:** −147.6°F = −99.8°C = 173.4 K
13 5 **Critical Temperature:** 417°F = 213°C = 487°K
13 6 **Critical Pressure:** 870 psia = 59.2 atm = 6.00 MN/m
13 7 **Specific Gravity:** 0.977 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 25 dynes/cm = 0.025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 2.07
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.1446
13 12 **Latent Heat of Vaporization:** 202 Btu/lb = 112 cal/g = 4.69 × 10³ J/kg
13 13 **Heat of Combustion:** −6 980 Btu/lb = −3 880 cal/g = −162 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

MHZ METHYLHYDRAZINE

Common Synonyms

Monomethylhydrazine
MMH

Liquid Colorless Ammonia-like odor

Mixes with water Poisonous flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
Wear Self-Contained Breathing Apparatus
Wear Rubber Boots and Gloves
Notify Local Health and Pollution Control Agencies
Keep Combustibles (Wood, Paper, Oil, etc) Away
Stop Leak if You Can Do It Without Risk
Isolate Area Until Gas Has Dispersed
Use Water Spray to Reduce Vapors or Divert Vapor Cloud Drift
Do Not Get Water Inside Container
Do Not Touch or Walk Through Spilled Material
Stop Leak if You Can Do It Without Risk
Prevent Entry into Waterways, Sewers, Basements or Confined Areas
Isolate Area Until Gas Has Dispersed
Use Water Spray to Reduce Vapors or Divert Vapor Cloud Drift
Do Not Get Water Inside Container
Do Not Touch or Walk Through Spilled Material
Prevent Entry into Waterways, Sewers, Basements or Confined Areas
Wear Self-Contained Breathing Apparatus
Wear Rubber Boots and Gloves
Notify Local Health and Pollution Control Agencies
Keep Combustibles (Wood, Paper, Oil, etc) Away

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
May explode if exposed to heat or flames
Fight fire from explosion proof area or distance or use unmanned hose holder or monitor nozzles
Water spray may be ineffective
Fight fire from protected location or safe distance
Apply water from as far a distance as possible
Use water spray to cool fire exposed containers
Use water spray to disperse vapors and protect men stopping the leak
Do not get water inside containers
Cool containers with flooding quantities of water until well after fire is out
Withdraw immediately in case of rising sound from venting safety device or discoloration of tank
ALWAYS stay away from ends of tanks

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes, nose and throat
Move victim to fresh air
Call emergency squad or physician
Administer oxygen if breathing is difficult
Give artificial respiration if victim is not breathing
Flush eyes with water immediately
Wash skin with soap and water
Cover burns with sterile dressing
Give nothing by mouth
Keep victim warm and quiet
Get medical attention as soon as possible

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes
Remove victim immediately to hospital
Call physician immediately
IN CASE OF CONTACT IMMEDIATELY FLUSH SKIN OR EYES with plenty of water for at least 15 minutes
IF SWALLOWED and victim is CONSCIOUS induce vomiting by having victim drink two glasses of water and touching back of throat with finger
DO NOT induce vomiting or give anything by mouth to an unconscious person
Keep victim warm and quiet
Get medical attention as soon as possible

Water Pollution

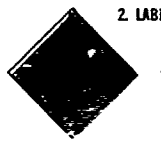
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Issue warning: poison, high flammability, water contaminant, air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABELS





3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Monomethylhydrazine, MMH
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** CH_3NHNH_2
3 4 **IMCO/United Nations Numerical Designation:** 3 2/1244

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Like ammonia

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic canister mask or self-contained breathing apparatus, goggles or face shield, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure:** Tremors and convulsions follow absorption by any route. Inhalation causes local irritation of respiratory tract, respiratory distress, and systemic effect. Contact of liquid with eyes or skin causes irritation and burns. Ingestion causes irritation of mouth and stomach.

5 3 **Treatment for Exposure:** Get medical attention at once following all exposures to this compound. INHALATION: move victim to fresh air and keep him quiet, give artificial respiration if breathing stops. EYES: flush for at least 15 min. with large quantities of water. SKIN: immediately wash with large quantities of water and treat as for alkali burn. INGESTION: give egg whites or other emollient, followed by a 5% salt solution or other mild emetic. Keep patient as quiet as possible. To control convulsions, short acting barbituates may be administered parenterally by a physician with due regard for depression of respiration.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 ppm

5 5 **Short-Term Inhalation Limits:** 90 ppm for 10 min., 30 ppm for 30 min., 15 ppm for 60 min.

5 6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 33 mg/kg (rat)

5 7 **Late Toxicity:** Hemolytic anemia may result from large doses by any route

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.

(Continued on page 4)

6. FIRE HAZARDS

6 1 **Flash Point:** 62°F O C
6 2 **Flammable Limits in Air:** 2.5% 98%
6 3 **Fire Extinguishing Agents:** Water or dry chemical
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Irritating nitrogen oxides are produced
6 6 **Behavior in Fire:** May explode
6 7 **Ignition Temperature:** 382°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 2.0 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Reacts slowly with air, but heat may cause ignition of rags, rust or other combustibles
7 3 **Stability During Transport:** Stable. Do not in contact with iron, copper or their alloys
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Olin Corporation
120 Long Ridge Road
Stamford, Conn. 06904

2 Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

3 Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Propellant grade 99+% Laboratory grade 98+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Padded with nitrogen
10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X P Q R S

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 46.1
13 3 **Boiling Point at 1 atm:** 189.5°F = 87.5°C = 360.7°K
13 4 **Freezing Point:** −62.3°F = −52.4°C = 220.8°K
13 5 **Critical Temperature:** 594°F = 312°C = 585°K
13 6 **Critical Pressure:** 1195 psia = 81.3 atm = 8.25 MN/m²
13 7 **Specific Gravity:** 0.878 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 34.3 dynes/cm = 0.0343 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 1.39
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.1326
13 12 **Latent Heat of Vaporization:** 376 Btu/lb = 209 cal/g = 8.75 × 10⁵ J/kg
13 13 **Heat of Combustion:** −12,178 Btu/lb = −6,766 cal/g = −283.1 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

5 HEALTH HAZARDS (Cont'd)

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5 10 **Odor Threshold:** 1.3 ppm

MIC METHYL ISOBUTYL CARBINOL

Common Synonyms
Methylamyl alcohol
4-Methyl-2-pentanol
Isobutylmethylcarbinol

Oily liquid — Colorless — Mild alcohol odor

Floats on water. Irritating vapor is produced

[illegible]

Fire

Combustible
Extinguish with dry chemical, alcohol foam, carbon dioxide
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
Harmful if skin is exposed
If inhaled, will cause dizziness or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

2.1 **Synonyms:** Isobutylmethylcarbinol, Methylamyl Alcohol, MAOH, 4-Methyl-2-pentanol, MIBC, MIC

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $(CH_3)_2CHCH_2CHOHCH_3$

3.4 **IMCO, United Nations Numerical Designation:** 1.1/2053

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild, sharp, non-residual

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air pack or organic canister mask, rubber gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose, may cause anesthesia. Prolonged contact with liquid causes irritation and cracking of skin, also irritates eyes

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, give artificial respiration if needed, call a doctor. SKIN: flush with water. EYES: flush with water for at least 15 min, consult a doctor

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 120-130°F O.C. 106°F C.C.

6.2 **Flammable Limits in Air:** 1.0% - 5.5%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 370 ppm/24 hr/brine shrimp/TL_m

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 50% of theoretical in 5 days, freshwater

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co.
   Houston, Tex. 77001
2. Shell Chemical Co.
   Industrial Chemicals Division
   Houston, Tex. 77001
3. Union Carbide Corp.
   Chemicals & Plastics Division
   270 Park Ave.
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-Q-F-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 102.18

13.3 **Boiling Point at 1 atm:** 269.2°F = 131.8°C = 405°K

13.4 **Freezing Point:** <-130°F = <-90°C = <183°K

13.5 **Critical Temperature:** 556°F = 291°C = 564°K

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.807 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 22.8 dynes/cm = 0.0228 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.053

13.12 **Latent Heat of Vaporization:** 162 Btu/lb = 90.1 cal/g = 3.77 × 10^5 J/kg

13.13 **Heat of Combustion:** (est.) -16,600 Btu/lb = -9,300 cal/g = -387 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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MIK — METHYL ISOBUTYL KETONE

Common Synonyms
4-Methyl-2-pentanone
Isohexyl methyl Ketone
MIBK

Watery liquid | Colorless | Mild pleasant odor

Floats and mixes slowly with water. Flammable irritating vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or loss of consciousness.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning: high flammability
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hexone; Isobutyl methyl ketone; Isopropylacetone; 4-Methyl-2 pentanone, MIBK, MIK
3.2 **Coast Guard Compatibility Classification:** Ketone
3.3 **Chemical Formula:** $(CH_3)_2CHCH_2COCH_3$
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1245

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pleasant mild characteristic, sharp non residual, ketonic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air pack, rubber gloves, goggles or face shield
5.2 **Symptoms Following Exposure:** Vapor causes irritation of eyes and nose, high concentrations cause anesthesia and depression. Liquid dries out skin and may cause dermatitis, irritates eyes but does not injure them.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, give artificial respiration if needed, call a doctor. SKIN OR EYES: wash eyes thoroughly with water, wash skin with water until irritation stops.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** 100 ppm for 60 min.
5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.47 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 73°F C.C., 75°F O.C.
6.2 **Flammable Limits in Air:** 1.4% - 7.5%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated
6.6 **Behavior in Fire:** Vapors may travel a considerable distance and ignite
6.7 **Ignition Temperature:** 854°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biochemical Oxygen Demand (BOD):** (theor.) 1.8%, 0.5 day, (theor.) 12%, 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
   Houston, Tex. 77001
2. Shell Chemical Co
   Industrial Chemicals Division
   Houston, Tex. 77001
3. Union Carbide Corp
   Chemicals & Plastics Division
   270 Park Ave
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A-P-Q-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 100.16
13.3 **Boiling Point at 1 atm:** 241.2°F = 116.2 = 389.4°K
13.4 **Freezing Point:** −119°F = −84°C = 189°K
13.5 **Critical Temperature:** 568.9°F = 298.3°C = 571.5°K
13.6 **Critical Pressure:** 475 psia = 32.3 atm = 3.27 MN/m
13.7 **Specific Gravity:** 0.802 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 23.6 dynes/cm = 0.0236 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 15.7 dynes/cm = 0.0157 N/m at 22.7°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.061
13.12 **Latent Heat of Vaporization:** 149 Btu/lb = 82.5 cal/g = 3.45×10^5 J/kg
13.13 **Heat of Combustion:** (est.) −10,400 Btu/lb = −5,800 cal/g = -242×10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = -0.2×10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 6)

NOTES

REVISED 1978

MPK — METHYL ISOPROPENYL KETONE, INHIBITED

Common Synonyms

2 Methyl-1-butene-3-one

Liquid | Colorless | Sweet pleasant odor

Floats on water | Flammable | Irritating vapor is produced

Shut off ignition sources | Call fire department | Stop discharge if possible | Keep people away
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Control fires from safe distance or protected location
Extinguish with dry chemicals, foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

Call for medical aid

VAPOR

Irritating to eyes, nose and throat.
Move victim to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID

Irritating to skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting; keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, water contaminant
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Isopropenyl methyl ketone; 2 Methyl-1-butene-3-one

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_2C(CH_3)=CH-$

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1246

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Very pungent, pleasant sweet

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Liquid may cause severe damage to eyes, resulting possibly in some permanent impairment of vision; vapor produces tears. If not removed promptly from skin, liquid may cause delayed pain and blistering. Ingestion causes irritation of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, give artificial respiration if needed, call physician. EYES: immediately irrigate with copious amounts of water for 15 min, call physician. SKIN: wash off skin with large volumes of water for 15 min, call physician if burn has occurred. INGESTION: induce vomiting, call physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 180 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting and first degree burns on short exposure; may cause second-degree burns on long exposure.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** <71°F (C.C.)

6.2 **Flammable Limits in Air:** 1.8% - 9.0%

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May polymerize and explode

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Will polymerize in the absence of inhibitor, especially when heated

7.6 **Inhibitor of Polymerization:** Typically hydroquinone

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Eastern Chemical Division
230 Marcus Boulevard
Hauppauge, L.I., N.Y. 11787

2. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

N.T.U.-A.W.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	*
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	*
Water	0
Self Reaction	*

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 84.1

13.3 **Boiling Point at 1 atm:**
203°F = 95°C = 368°K

13.4 **Freezing Point:**
−65°F = −54°C = 219°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.85 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.)
26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.)
30 dynes/cm = 0.030 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 2.9

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.079 at 20°C (68°F)

13.12 **Latent Heat of Vaporization:** (est.)
182 Btu/lb = 101 cal/g
= 4.23 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.)
−15,500 Btu/lb = −8,600 cal/g
= −360 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent.

13.15 **Heat of Solution:** Not pertinent.

13.16 **Heat of Polymerization:** (est.) −380 Btu/lb
= −210 cal/g = −8.8 × 10⁵ J/kg

Continued on pages 5 and 6

NOTES

MMC

METHYL MERCAPTAN

Common Synonyms

Methanethiol
Mercaptomethane
Thiomethyl alcohol
Methyl sulfhydrate

Liquefied compressed gas Colorless Strong garlic odor

Floats and boils on water. Poisonous flammable vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).
Shut off ignition sources; call fire department.
Stop discharge if possible.
Evacuate area in case of large discharge.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Let fire burn.
Stop flow of gas if possible.
Cool exposed containers and protect personnel effectively with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR

POISONOUS IF INHALED.
Irritating to eyes, nose and throat.
Move victim to fresh air.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

POISONOUS IF SWALLOWED.
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, water contaminant, air contaminant.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mercaptomethane, Methanethiol, Methyl sulfhydrate, Thiomethyl alcohol

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CH_4S

3.4 **IMCO/United Nations Numerical Designation:** 2.1/1064

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Garlic, foul, strong, penetrating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles or face shield, air line or self-contained breathing apparatus.

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory system, nausea, paralysis, unconsciousness; death may follow respiratory paralysis. Contact with liquid irritates eyes and skin; ingestion causes irritation of mouth and stomach, plus symptoms described for inhalation.

5.3 **Treatment, for Exposure:** INHALATION: remove patient immediately from the contaminated area; keep him warm and at complete rest; if necessary, give artificial respiration until medical assistance can be obtained; oxygen or oxygen-CO_2 inhalation is recommended, continuing after spontaneous breathing has returned. EYES: for exposure to vapor, apply hot and cold compresses to reduce pain of conjunctivitis; for exposure to liquid, wash with water and obtain medical assistance. SKIN: wash with water. INGESTION: induce vomiting and follow with gastric lavage.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0 ppm

5.5 **Short-Term Inhalation Limits:** 20 ppm for 5 min

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 0.0021 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (flammable liquefied compressed gas)

6.2 **Flammable Limits in Air:** 3.9% - 21.8%

6.3 **Fire Extinguishing Agents:** Preferably let fire burn, stop gas flow. Fires may be extinguished with dry chemical, foam or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.

6.5 **Special Hazards of Combustion Products:** Irritating sulfur dioxide is produced.

6.6 **Behavior in Fire:** Containers may explode.

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 10 ppm/105 min/white bass/death/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Amoco Chemicals Corporation
130 East Randolph Drive
Chicago, Ill 60601

2. Pennwalt Corporation
Chemicals Division
Three Parkway
Philadelphia, Pa 19102

3. Matheson Gas Products Co
East Rutherford, N J 07073

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99.5+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NBC-N-1-M-S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 48.1

13.3 **Boiling Point at 1 atm:** 43.2°F = 6.2°C = 279.4°K

13.4 **Freezing Point:** −189°F = −123°C = 150°K

13.5 **Critical Temperature:** 386.2°F = 196.8°C = 470.0°K

13.6 **Critical Pressure:** 1,050 psia = 71.4 atm = 7.25 MN/m²

13.7 **Specific Gravity:** 0.892 at 0°C (liquid)

13.8 **Liquid Surface Tension:** 31 dynes/cm = 0.031 N/m at 5°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.66

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1938

13.12 **Latent Heat of Vaporization:** 220 Btu/lb = 122 cal/g = 5.10 × 10⁵ J/kg

13.13 **Heat of Combustion:** −11,054 Btu/lb = −6,141 cal/g = −257.0 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

MMM

METHYL METHACRYLATE

Common Synonyms
Methacrylic acid methyl ester

Liquid | Colorless | Pleasant sharp odor

Floats on water. Flammable, irritating vapor is produced

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Containers may explode when heated.
Vapor may explode if ignited in an enclosed area.

Exposure

SEE FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Evacuate area
Disperse and flash

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Methacrylate monomer; Methacrylic acid, methyl ester; Methyl α-methylacrylate; Methyl 2-methyl 2 propenoate

3.2 **Coast Guard Compatibility Classification:** Acrylate

3.3 **Chemical Formula:** $CH_2=C(CH_3)COOCH_3$

3.4 **IMCO/United Nations Numerical Designation:** 3 2/1247

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp, fragrant, pleasant smelling pungent ester

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air mask, plastic gloves, goggles

5.2 **Symptoms Following Exposure:** Irritation of eyes, nose, and throat. Nausea and vomiting. Liquid may cause skin irritation.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, apply artificial respiration and oxygen if needed, refer to physician. SKIN OR EYES: flush with plenty of water for 15 min., refer to physician for eye exposure.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1, LD_{50} 5 to 15 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** 0.05 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 50°F O.C.

6.2 **Flammable Limits in Air:** 2.1% - 12.5%

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Containers may explode in fire or when heated because of polymerization.

6.7 **Ignition Temperature:** 790°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.5 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Heat, oxidizing agents, and ultraviolet light may cause polymerization

7.6 **Inhibitor of Polymerization:** Hydroquinone, 22-65 ppm, hydroquinone methyl ether, 22-120 ppm, dimethyl tert-butylphenol, 45-65 ppm

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 250 ppm/96 hr/bluegill/TL_m/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** (theor.) 1.4 lb/lb, 10 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 American Cyanamid Co.
Industrial Chemicals & Plastics Division
Wayne, N. J. 07470

2 E. I. duPont de Nemours & Co. Inc.
Industrial and Biochemicals Dept.
Wilmington, Del. 19898

3 Rohm and Haas Co.
Independence Mall West
Philadelphia, Pa. 19105

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.8%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A-P-Q-T-U-V-W-Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 100.12

13.3 **Boiling Point at 1 atm:** 214°F = 101°C = 374°K

13.4 **Freezing Point:** -54°F = -48°C = 225°K

13.5 **Critical Temperature:** 561°F = 294°C = 567°K

13.6 **Critical Pressure:** 485 psia = 33 atm = 3.3 MN/m²

13.7 **Specific Gravity:** 0.945 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 28 dynes/cm = 0.028 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 14.3 dynes/cm = 0.0143 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.050

13.12 **Latent Heat of Vaporization:** 140 Btu/lb = 77 cal/g = 3.2 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) = 11,400 Btu/lb = -6,310 cal/g = -264 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** -248 Btu/lb = -138 cal/g = -5.78 × 10⁵ J/kg

(Continued on pages 3 and 4)

NOTES

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MPT	# METHYL PARATHION

Common Synonyms
Metron
MPT
Parathol
Alkron
Nitron
Wofatox

Solid crystals or liquid or solution — White solid or brown liquid — Rotten eggs or garlic odor

Solid and liquid not in water, solution floats on water
Melting (freezing) point is 65° F

[illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED
Containers may explode in fire

[illegible]

Exposure

[illegible]
LIQUID OR SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Solution is foaming to shoreline
May be dangerous if it enters water intakes.

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 448-4)

Issue warning - poison, water contaminant
Restrict access
Shoreline should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** MPT, O,O-Dimethyl O-(p-Nitrophenyl) Phosphorothioate, O,O-Dimethyl O-p-Nitrophenyl Thiophosphate, Parathion-methyl

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $(CH_3O)_2PSOC_6H_4NO_2$

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1658

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid

4.2 **Color:** Colorless solid or brownish liquid

4.3 **Odor:** Characteristic; like rotten eggs or garlic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved mask or respirator, natural rubber gloves, over shoes, protective clothing, goggles

5.2 **Symptoms Following Exposure:** Exposure to fumes from a fire, or to the liquid, causes headache, blurred vision, constricted pupils of the eyes, weakness, nausea, cramps, diarrhea, and tightness in the chest. Muscle twitch and convulsions may follow. Symptoms may develop over a period of 8 hrs.

5.3 **Treatment for Exposure:** *Speed is essential.* INGESTION: call a doctor. If victim is not breathing, immediately institute artificial respiration by mouth-to-mouth, mouth-to-nose, or mouth-to-oropharyngeal method, when victim is conscious, give milk, water, or salt water and induce vomiting repeatedly. SKIN OR EYES: flood and wash exposed areas thoroughly with water. remove contaminated clothing under a shower.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (vapor); 100 ppm (solution)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4. LD_{50} below 50 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Poisonous when absorbed through skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 115°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic gases are produced in fires

6.6 **Behavior in Fire:** Drums may rupture violently

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Half decomposed in 8 days at 40°C

7.2 **Reactivity with Common Materials:** Is absorbed by wood, etc., which must be replaced to eliminate poison hazard

7.3 **Stability During Transport:** Decomposes above 50°C with possible explosive force

7.4 **Neutralizing Agents for Acids and Caustics:** Apply caustic or soda ash slurry until yellow stains disappear

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
1.9 ppm/96 hr/bluegill/TL$_m$/fresh water
8.3 ppm/96 hr/fathead/TL$_m$/fresh water

8.2 **Waterfowl Toxicity:** LD_{50}=10 mg/kg

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Hercules, Inc
Synthetics Dept
Plaquemine, La 70764

2 Monsanto Co
Agricultural Division
800 N Lindbergh Blvd
St Louis, Mo 63166

3 Stauffer Chemical Co
Agricultural Chemicals Division
Green Farms Rd
Westport, Conn 06880

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure (solid); technical (liquid), 80% in xylene

10.2 **Storage Temperature:** Below 50°

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 448-3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification	
	Xylene sol'n	Solid
Health Hazard (Blue)	4	3
Flammability (Red)	3	1
Reactivity (Yellow)	2	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid or solid

13.2 **Molecular Weight:** 263.2

13.3 **Boiling Point at 1 atm:** Very high

13.4 **Freezing Point:** 65°F = 18°C = 291°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.360 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** No, pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MPD — METHYL PHOSPHONOTHIOIC DICHLORIDE (ANHYD)

Common Synonym	Liquid	Colorless	Sharp Unpleasant Odor
MPTD	Sinks and reacts violently with water		

Fire

Combustible
Irritating gases may be produced when heated

Exposure

AVOID CONTACT OF ALL FORMS WITH THE BODY

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning - corrosive water contaminant
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** MPTD
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** CH_3PSCl_2
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Clear
4.3 **Odor:** Acrid

5. HEALTH HAZARDS

Use extreme care when handling this compound. Avoid any contact with liquid or vapor

5.1 **Personal Protective Equipment:** Rubber or neoprene gloves, respirator, protective goggles
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat; effects are quite similar to those of phosgene. Ingestion causes irritation of mouth and stomach. Delayed painful eye irritation may occur from exposure to vapor. Liquid causes severe irritation; contact with skin causes irritation and burns.
5.3 **Treatment for Exposure:** *Get medical attention after all exposures to this compound.* INHALATION: remove victim to fresh air; alert physician to delayed effects similar to those of phosgene. INGESTION: give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** >122°F O.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam
6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride, sulfur dioxide and other fumes may be formed in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with water to form hydrochloric acid and hydrogen chloride vapor. The reaction may be violent
7.2 **Reactivity with Common Materials:** Corrosive to metals because of its hydrolysis
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water. Treat with dilute sodium bicarbonate or soda ash solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Ethyl Corporation
Industrial Chemicals Div
451 Florida
Baton Rouge, La. 70801

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(Chemical Hazard Assessment Handbook, CG-446-3)

A.O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 134
13.3 **Boiling Point at 1 atm:** Data not available
13.4 **Freezing Point:** -14.1°F = -25.6°C = 24 °K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.42 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** test 1210 Btu/lb = 60 cal/g = 2.4 x 10^3 J/kg
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

MPY 1-METHYLPYRROLIDONE

Common Synonyms
N-Methylpyrrolidone
1 Methyl-2 pyrrolidinone
N-Methylpyrrolidinone
N-Methyl-alpha-pyrrolidone

Liquid | White | Mild Fishy odor

May float or sink in water

As a fire contact with liquid Keep people away
Stop discharge if possible
Call fire department
Isolate and remove unburned material
Notify local health and wildlife officials

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
Wear goggles and self-contained breathing apparatus
Extinguish with dry chemicals foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS induce victim to drink water, milk or honey in small quantities
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1-Methyl-2-pyrrolidinone, N-Methylpyrrolidinone, N Methyl pyrrolidone, N Methyl *alpha* pyrrolidone

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** C_5H_9NO

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild amine like

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation of hot vapors can irritate nose and throat Ingestion causes irritation of mouth and stomach Contact with eyes causes irritation Repeated and prolonged skin contact produces a mild transient irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amount of water and induce vomiting EYES flush with water for at least 15 min SKIN remove from skin and eyes by flooding the affected tissues with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 3 5 mg/kg (rabbit)

5 7 **Late Toxicity:** Causes blood abnormalities in rats

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 204°F O C

6 2 **Flammable Limits In Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in fire

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature.** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

2 Eastman Organic Chemicals
Rochester N Y 14650

3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 99

13 3 **Boiling Point at 1 atm:** 396°F = 202°C = 475°K

13 4 **Freezing Point:** 1°F = −17°C = 256°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 1 03 at 25°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 3 4

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** −13 000 Btu/lb = −7 220 cal/g = −302 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 61)

NOTES

MSR	# alpha-METHYLSTYRENE

Common Synonyms
Isopropenylbenzene
Phenylpropylene
1-Methyl-1-phenylethylene

Liquid Colorless

Floats on water.

Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemicals, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting

Avoid contact. Keep victim calm and warm.
Remove contaminated clothing and shoes.
Flush skin with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Isopropenylbenzene
1-Methyl-1-phenylethylene
Phenylpropylene

3 2 **Coast Guard Compatibility Classification:** Olefin

3 3 **Chemical Formula.** $C_6H_5C(CH_3)=CH_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Neoprene gloves, splashproof goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract, headache, dizziness, light headedness and breathlessness. Ingestion causes irritation of mouth and stomach. Contact with liquid irritates eyes. Prolonged skin contact can cause severe rashes, swelling and blistering.

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, if he is not breathing, give artificial respiration, contact a physician, keep victim quiet and warm. INGESTION: do NOT induce vomiting, call physician. EYES: flush with water for at least 15 min., get medical attention. SKIN: wash area with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5 5 **Short-Term Inhalation Limits:** 100 ppm, 30 min.

5 6 **Toxicity by Ingestion:** Grade 2, LD_{50}: 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** <10 ppm

6. FIRE HAZARDS

6 1 **Flash Point:** 137°F C.C.

6 2 **Flammable Limits in Air:** 1.9% - 6.1%

6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 1065°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Hazardous polymerization unlikely to occur except when in contact with alkali metals or metallo-organic compounds

7 6 **Inhibitor of Polymerization:** 10 - 20 ppm tert-butylcatechol

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 10 ppm, 96 hr/fathead minnow/TLm

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Plastics Division
P O Box 2 65R
Morristown, N J 07960

2 United States Steel Co
Chemicals Division
600 Grant St
Pittsburgh, Pa 15230

3 Dow Chemical Co
2030 Dow Center
Midland, Mich 48640

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

C T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 118.17

13 3 **Boiling Point at 1 atm.** 329°F = 165°C = 438°K

13 4 **Freezing Point:** −9.8°F = −23.2°C = 250.0°K

13 5 **Critical Temperature:** 719.1°F = 381.7°C = 654.9°K

13 6 **Critical Pressure:** 494 psia = 33.6 atm = 3.41 MN/m

13 7 **Specific Gravity:** 0.91 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 33.88 dynes/cm. = 0.03386 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** Data not available

13 10 **Vapor (Gas) Specific Gravity:** 4.08

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.060 at 27°C

13 12 **Latent Heat of Vaporization:** 140.4 Btu/lb = 78.0 cal/g = 3.26×10^5 J/kg

13 13 **Heat of Combustion:** −17,690 Btu/lb = −9,830 cal/g = -411×10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Data not available

(Continued on pages 5 and 6)

NOTES

MTS

METHYLTRICHLOROSILANE

Common Synonyms

Liquid Colorless Sharp irritating odor

Reacts violently with water Irritating gas is produced on contact with water

AVOID CONTACT WITH LIQUID AND VAPOR KEEP UPWIND
Wear goggles Use self-contained breathing apparatus
Wear rubber clothing Rubber gloves
Stop flow of gas if possible
Is fire small enough for dry chemical or CO2?
Notify local health and pollution control agencies

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus
Extinguish with dry chemicals, carbon dioxide
DO NOT USE WATER OR FOAM ON FIRE
DO NOT USE WATER OR FOAM ON ADJACENT FIRES

Exposure

Call for medical aid

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
Move victim to fresh air
If not breathing, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
air contaminant
Restrict access
Evacuate area
Disperse and flush with care

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichloromethylsilane

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula.** CH_3SiCl_3

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1250

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Acrid, sharp, like hydrochloric acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protective clothing, acid vapor type respiratory protection, rubber gloves, chemical worker's goggles, other protective equipment as necessary to protect skin and eyes

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach

5.3 **Treatment of Exposure:** Get medical attention at once following all exposures to this compound. INHALATION: remove victim from exposure, give artificial respiration if breathing has ceased. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting, give large amounts of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3. LD_{50} to 560 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** Decomposes in moist air, creating HCl with odor threshold of 1 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 45°F (7°C) (15°F (-9°C))

6.2 **Flammable Limits in Air:** <1% >20%

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water, foam

6.5 **Special Hazards of Combustion Products.** Toxic hydrogen chloride and phosgene gases may form in fire

6.6 **Behavior in Fire:** Difficult to extinguish; reignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride

6.7 **Ignition Temperature** >760°F

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate:** 1.9 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride (hydrochloric acid)

7.2 **Reactivity with Common Materials:** Reacts with surface moisture to evolve hydrogen chloride, which is corrosive to metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640

3. General Electric Company
Silicone Products Department
Waterford, N.Y. 12188

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 98+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	3
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 149.5

13.3 **Boiling Point at 1 atm.** 151.5°F = 66.4°C = 339.6°K

13.4 **Freezing Point:** −130°F = −90°C = 183°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.27 at 25°C (liquid)

13.8 **Liquid Surface Tension:** 20.3 dynes/cm = 0.0203 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 5.16

13.11 **Ratio of Specific Heats of Vapor (Gas).** Data not available

13.12 **Latent Heat of Vaporization.** 89.3 Btu/lb = 49.6 cal/g = 2.08 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) −3,000 Btu/lb = −1,700 cal/g = −70 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

MVK METHYL VINYL KETONE

Common Synonyms

3 Buten 2-one

Liquid | Colorless to light yellow | Strong irritating odor

Mixes with water. Irritating vapor is produced

AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY
Wear self-contained breathing apparatus and protective clothing
Shut off ignition sources; call fire department
Stop leak if no hazard
Stay upwind. Use water spray to knock down vapor
In case of fire, use foam on flammable material
Notify local health and pollution control agencies

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Extinguish with dry chemical, alcohol foam, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

Move victim to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen
LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS, have him drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, water contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 3 Buten 2-one
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula:** $CH_3COCH{=}CH_2$
3.4 **IMCO/United Nations Numerical Designation.** 3.2/1251

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to light yellow
4.3 **Odor:** Powerfully irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Self contained breathing apparatus with full face piece, rubber gloves, chemical goggles or face piece of breathing apparatus
5.2 **Symptoms Following Exposure.** Inhalation causes irritation of nose and throat. Vapor causes tears; contact with liquid can burn eyes. Liquid irritates skin and will cause burn if not removed at once. Ingestion causes irritation of mouth and stomach
5.3 **Treatment for Exposure.** Get medical attention for all exposures to this compound. INHALATION: move victim to fresh air; administer artificial respiration if necessary. EYES or SKIN: flush with copious quantity of water for 15 min. INGESTION: do NOT induce vomiting
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion.** Grade 4, LD_{50} < 50 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold.** 0.5 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point:** 30°F (0°C) (CC)
6.2 **Flammable Limits in Air:** 2.1 - 15.6%
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire.** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. At elevated temperatures (fire conditions) polymerization may take place in containers, causing violent rupture. Unburned vapors are very irritating
6.7 **Ignition Temperature:** 918°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 4.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** Polymerizes spontaneously upon exposure to heat or sunlight
7.6 **Inhibitor of Polymerization.** 1 ppt to 1% hydroquinone

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Pfizer, Incorporated
Pfizer Chemical Division
235 East 42nd Street
New York, N.Y. 10017

2 Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, Wis. 53233

3 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 98.5+%
10.2 **Storage Temperature:** Cool, ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

V P Q R S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid
12.2 **NAC Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 70.1
13.3 **Boiling Point at 1 atm:** 176.5°F = 81.4°C = 354.6°K
13.4 **Freezing Point:** -20.1°F = -7°C = 266°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.864 at 20°C (liquid)
13.8 **Liquid Surface Tension** (est.): 24 dynes/cm = 0.024 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.4
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1053
13.12 **Latent Heat of Vaporization** (est.): 203 Btu/lb = 113 cal/g = 4.73 × 10⁵ J/kg
13.13 **Heat of Combustion:** (est.) -14 600 Btu/lb = -8 100 cal/g = -340 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** -455 Btu/lb = -253 cal/g = -10.6 × 10⁵ J/kg

(Continued on pages 5 and 6)

NOTES

MNS — MINERAL SPIRITS

Common Synonyms
Petroleum spirits
Naphtha

Watery liquid | Colorless | Gasoline-like odor

Floats on water

[illegible]

Fire

Combustible
Extinguish with water dry chemical carbon dioxide or foam
Use expansive vapor suppressing water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed.
[illegible]
Flush with plenty of water
IF IN EYES hold eyelids open flush with plenty of water
IF SWALLOWED do not induce VOMITING unless directed by doctor
[illegible]
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Naphtha
Petroleum spirits

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO/United Nations Numerical Designation:** 3.3/1300

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Plastic gloves, goggles or face shield (as for gasoline)

5.2 **Symptoms Following Exposure:** INHALATION mild irritation of respiratory tract ASPIRATION severe lung irritation and rapidly developing pulmonary edema central nervous system excitement followed by depression INGESTION irritation of stomach

5.3 **Treatment of Exposure:** INHALATION remove victim to fresh air ASPIRATION enforce bed rest, give oxygen call a doctor INGESTION do NOT induce vomiting, guard against aspiration into lungs EYES wash with copious amounts of water SKIN wipe off and wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5.5 **Short-Term Inhalation Limits:** 4000 - 7000 ppm for 60 min

5.6 **Toxicity by Ingestion:** Grade 2, 1 D_{50} 0.5 to 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 105-140°F C.C., depending on grade

6.2 **Flammable Limits in Air:** 0.8% - 5.0%

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Do not use straight hose water stream

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 540°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 8%, 5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Atlantic Richfield Co
717 Fifth Ave
New York, N Y 10022

2 Phillips Petroleum
Bartlesville, Okla 74004

3 Shell Oil Co
1 Shell Plaza
Houston, Tex 77001

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Various grades available 70-100% of the materials are derived from petroleum, and 0-30% are aromatic hydrocarbons like benzene and toluene Flash points vary with the exact composition but are usually above 100°F

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 445-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** 310 - 395°F = 154 - 202°C = 428 - 475°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.78 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MTO	# MOLYBDIC TRIOXIDE

Common Synonyms			
Molybdenum trioxide Molybdic anhydride	Solid Sinks in water	Colorless to white or yellow	Odorless

[illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IN EYES [illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Molybdenum trioxide, Molybdic anhydride
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** MoO_3
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Colorless or white-yellow to yellow
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U S Bu Mines approved respirator, safety glasses or face shield, protective gloves
5 2 **Symptoms Following Exposure** Compound is relatively nontoxic Dust irritates eyes
5 3 **Treatment for Exposure:** No treatment necessary except those applicable to any nontoxic dust EYES flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Grade 3 LD$_{50}$ 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 70 ppm/96 hr/fathead minnow/TL m soft water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential.** None listed

9. SELECTED MANUFACTURERS

1 Kennecott Copper Corp
Utah Copper Div
P O Box 11299
Salt Lake City, Utah 84111

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown, N J 07960

4 Climax Molybdenum Company
One Greenwich Plaza
Greenwich, Conn 06830

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical 99.8 - 61 6% Reagent
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 143 94
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 4 69 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

MCA	# MONOCHLOROACETIC ACID

Common Synonyms	Solid or heated liquid	Cloudy white solid, liquid is colorless to light yellow	Strong vinegar-like odor
Chloroacetic acid Chloracetic acid	Mixes with water		

Avoid contact with liquid. Keep people away.
See discharge. Eye solids.
[illegible]
[illegible]
No [illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible] water

Exposure

Call for medical aid
LIQUID OR SOLID
Will burn skin and eyes.
Harmful if swallowed
[illegible]
IF IN EYES, [illegible] with water
IF SWALLOWED [illegible]
[illegible]
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify [illegible]
Notify [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Chloracetic acid
Chloroacetic acid

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $ClCH_2COOH$

3 4 **IMCO/United Nations Numerical Designation:** Liquid 8/1750
Solid 8/1751

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid or solid

4 2 **Color:** Solid: translucent white
Liquid: clear to light amber

4 3 **Odor:** Characteristic penetrating odor similar to vinegar

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus, vinyl or neoprene rubber gloves, goggles and protective face shield, rubberized or acid resistant clothing

5 2 **Symptoms Following Exposure:** Inhalation causes mucous membrane irritation. Contact with liquid causes severe irritation and burns of the eyes and irritation and burns of skin. Ingestion causes burns of mouth and stomach

5 3 **Treatment for Exposure:** Get medical attention for all exposures to this compound. INHALATION: remove victim to fresh air and enforce rest until medical attention is obtained. EYES: flush with running water for 15 min. SKIN: flush with water, get treatment for burns. INGESTION: give large amount of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} 76.2 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5 10 **Odor Threshold:** 0.15 mg/m³

6. FIRE HAZARDS

6 1 **Flash Point:** (almost nonflammable) 259°F C.C.

6 2 **Flammable Limits in Air:** n/a (LEL)

6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Hydrogen chloride and phosgene may be generated

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** (Data not available) difficult to ignite

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Causes mild corrosion of common metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with sodium bicarbonate or lime solution

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Hercules Incorporated
Coatings & Specialty Products Dept
910 Market Street
Wilmington, Del. 19899

2 Dow Chemical Co.
Midland, Mich. 48640

3 McKesson Chemical Co.
Crocker Plaza
One Post St.
San Francisco, Calif. 94104

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial 97 %+

10 2 **Storage Temperature:** Solid: ambient
Liquid: 70°C (158°F)

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Corrosive liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	2
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 94.5

13 3 **Boiling Point at 1 atm**
372°F = 189°C = 462 K

13 4 **Freezing Point:**
140°F = 60 C = 333°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.58 at 20°C (solid)

13 8 **Liquid Surface Tension**
33 dynes/cm = 0.033 N/m at 50 C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization** 250 Btu/lb = 139 cal/g = 5.82 × 10⁵ J/kg

13 13 **Heat of Combustion.** (solid) −1814 Btu/lb = −1008 cal/g = −42.17 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** −63 Btu/lb = −35 cal/g = −1.5 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

MCF — MONOCHLORODIFLUOROMETHANE

Common Synonyms
Freon 22
Genetron 22
Isotron 22
Ucon 22

Liquefied compressed gas Colorless Faint odor

Liquid sinks and boils in water. Visible vapor cloud is formed.

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

VAPOR
Not irritating to eyes, nose or throat
If inhaled, will cause dizziness or loss of consciousness

LIQUID
Will cause frostbite

Water Pollution

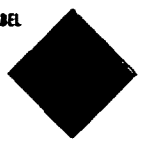
Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Chlorodifluoromethane
Eskimon 22 — Genetron 22
I 22 — Isotron 22
Freon 22 — Ucon 22

3 2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3 3 **Chemical Formula:** $CHClF_2$

3 4 **IMCO United Nations Numerical Designation:** 2 0 -018

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied gas

4 2 **Color:** Colorless

4 3 **Odor:** Faint ethereal like carbon tetrachloride

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, goggles

5 2 **Symptoms Following Exposure:** Inhalation at greater than 10% concentration in air may cause narcosis. Liquid may cause frostbite

5 3 **Treatment for Exposure:** Remove victim to non-contaminated area and apply artificial respiration if breathing has stopped. Call a physician immediately. Oxygen inhalation may be utilized

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Not pertinent

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin because it evaporates quickly. Liquid may cause frostbite

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Decomposition gases are toxic and irritating

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 E I duPont de Nemours & Co., Inc
Freon Products Division
Wilmington, Del. 19898

2 Pennwalt Corp
Chemicals Division
3 Penn Center
Philadelphia, Pa. 19102

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Propellant grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VC 1 J

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Nonflammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 86.48

13 3 **Boiling Point at 1 atm:** −40.9°F = −40.5°C = 232.7°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** 204.8°F = 96.0°C = 369.2°K

13 6 **Critical Pressure:** 716 psia = 4.87 atm = 4.93 MN/m²

13 7 **Specific Gravity:** 1.41 at −40°C (liquid)

13 8 **Liquid Surface Tension:** (est.) 15 dynes/cm = 0.015 N/m at −41°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** 3.0

13 11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.13

13 12 **Latent Heat of Vaporization:** 101.8 cal/g = 5.9 cal/g = 2.34 × 10⁴ J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(continued on page 5 and 6)

NOTES

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MEA — MONOETHANOLAMINE

Common Synonyms
beta-Aminoethyl alcohol
2-Hydroxyethylamine
Ethanolamine
2-Aminoethanol

Oily liquid | Colorless | Slight ammonia odor

Sinks and mixes with water. Freezing point is 51°F.

Fire

Combustible

Exposure

LIQUID OR SOLID
Irritating to skin and eyes.
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Dispose and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Aminoethanol
beta-Aminoethyl alcohol
Ethanolamine
2-Hydroxyethylamine

3.2 **Coast Guard Compatibility Classification:** Alkanolamines

3.3 **Chemical Formula:** $HOCH_2CH_2NH_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mildly ammoniacal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full face shield, goggles, eye wash facility

5.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. Liquid causes local injury to mouth, throat, digestive tract, skin, and eyes

5.3 **Treatment for Exposure:** INGESTION: induce vomiting by giving large volumes of warm salt water (2 tablespoons per glass); call a doctor. EYES: flush with water for at least 15 min.; call a doctor. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 3 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 185°F C.C., 200°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating vapors generated when heated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 7100 ppm/48 hr/shrimp/LC_{50}/salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 78%, 5 days, (theor.) 0%, 5 days, 64%, 20 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co
Midland, Mich. 48640
2. Jefferson Chemical Co
3336 Richmond Ave
Houston, Tex. 77052
3. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N. Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** NF, 85% (15% water), commercial 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive Material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	-
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 61.08

13.3 **Boiling Point at 1 atm:** 338°F = 170°C = 443°K

13.4 **Freezing Point:** 51°F = 10.5°C = 283.5°K

13.5 **Critical Temperature:** 646°F = 341°C = 614°K

13.6 **Critical Pressure:** 647 psia = 44 atm = 4.45 MN/m²

13.7 **Specific Gravity:** 1.016 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 360 Btu/lb = 200 cal/g = 8.37 × 10⁵ J/kg

13.13 **Heat of Combustion:** 10,710 Btu/lb = -5950 cal/g = -249 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Less than 1 Btu/lb = -10 cal/g = -0.4 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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MPA — MONOISOPROPANOLAMINE

Common Synonyms
Isopropanolamine
1 Amino-2-propanol
2-Hydroxypropylamine

Thick liquid Colorless Slight ammonia odor

Floats and mixes with water. Freezing point is 35° F

[illegible]

Fire

Combustible
[illegible]
Extinguish with [illegible]

Exposure

CALL FOR MEDICAL AID
LIQUID OR SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Amino-2-propanol; 2-Hydroxypropylamine; Isopropanolamine
3.2 **Coast Guard Compatibility Classification:** Alkanolamines
3.3 **Chemical Formula:** $CH_3CHOHCH_2NH_2$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mildly ammoniacal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full face shield, goggles, eye wash facility
5.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. Liquid causes local injury to mouth, throat, digestive tract, skin, and eyes
5.3 **Treatment for Exposure:** INGESTION: induce vomiting, give large volumes of warm salt water (2 tablespoons per glass), call a doctor. EYES: flush with water for at least 15 min. and call a doctor. SKIN: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2. LD_{50} 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 165°F O.C., 171°F C.C.
6.2 **Flammable Limits in Air:** 2.2% (calc.), 12% (est.)
6.3 **Fire Extinguishing Agents:** Dry chemical, water spray, alcohol foam or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating vapors generated when heated
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 706°F (est.)
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 1.1 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** (theor.) 1.51%, 5 days, 46%, 20 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co.
Midland, Mich. 48640

2 Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 98.5+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 75.11
13.3 **Boiling Point at 1 atm:** 320°F = 160°C = 433°K
13.4 **Freezing Point:** 35.4°F = 1.9°C = 275.1°K
13.5 **Critical Temperature:** 622°F = 328°C = 601°K
13.6 **Critical Pressure:** 850 psia = 58 atm = 5.9 MN/m²
13.7 **Specific Gravity:** 0.941 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 272 Btu/lb = 151 cal/g = 6.32 × 10⁵ J/kg
13.13 **Heat of Combustion:** (est.) −13,900 Btu/lb = −7,700 cal/g = −322 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** (est.) −17 Btu/lb = −10 cal/g = −0.4 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

MPL	# MORPHOLINE

Common Synonyms
Tetrahydro-2H-1,4-oxazine
Tetrahydro-p-oxazine

Oily liquid | Colorless | Fishy, ammonia odor

Floats and mixes with water. Irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, headache, or difficult breathing

LIQUID
Irritating to skin and eyes

Water Pollution

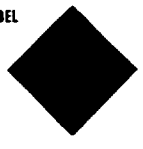
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diethylenimide oxide
Diethylene imidoxide
Diethylene oximide
Tetrahydro-2H-1,4-oxazine
Tetrahydro-p-oxazine

3.2 **Coast Guard Compatibility Classification:** Aliphatic amine

3.3 **Chemical Formula:** $OCH_2CH_2NHCH_2CH_2$

2.4 **IMCO/United Nations Numerical Designation:** 3.3/2054

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Fishy ammoniacal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister or self-contained breathing apparatus, rubber boots and gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Liquid causes skin and eye burns. Breathing vapors or absorption through skin may cause nausea and headache

5.3 **Treatment for Exposure:** INHALATION: if all effects occur, move patient to fresh air, keep him quiet and warm, and call a physician; if breathing stops, start artificial respiration. INGESTION: force milk or water; then immediately induce vomiting; treat symptomatically. No known antidote. SKIN OR EYES: immediately flush with plenty of water for at least 15 min; for eyes get medical attention promptly.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 20 ppm

5.5 **Short Term Inhalation Limits:** 20 ppm for 15 min

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} 0.5 to 5 g/kg (guinea pig, rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.01 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 100°F O.C.

6.2 **Flammable Limits in Air:** 1.8% - 10.8%

6.3 **Fire Extinguishing Agents:** Water fog, alcohol foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel some distance to source of ignition and flash back

6.7 **Ignition Temperature:** 590°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 1.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** (theor.) 0.9%, 5 days; 5.1%, 20 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Dow Chemical Co.
Midland, Mich. 48640

2 Jefferson Chemical Co., Inc.
3336 Richmond Ave.
P.O. Box 53300
Houston, Tex. 77052

3 Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Several grades available, most above 99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 87.12

13.3 **Boiling Point at 1 atm:** 262.8°F = 128.2°C = 401.4°K

13.4 **Freezing Point:** 23.4°F = −4.8°C = 268.4 °K

13.5 **Critical Temperature:** 653°F = 345°C = 618°K

13.6 **Critical Pressure:** 794 psia = 54 atm = 5.47 MN/m²

13.7 **Specific Gravity:** 1.00 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.091

13.12 **Latent Heat of Vaporization:** 182.9 Btu/lb = 101.6 cal/g = 4.254 × 10⁵ J/kg

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MFA — MOTOR FUEL ANTI-KNOCK COMPOUNDS CONTAINING LEAD ALKYLS

Common Synonyms

Oily liquid Dyed red, orange or blue Sweet fruity odor

Sinks in water

AVOID CONTACT WITH LIQUID AND VAPOR

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Container may explode when heated

Exposure

CALL FOR MEDICAL AID
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes

IF SWALLOWED

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning person
Restrict access
Evacuate area
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Motor fuel antiknock compound
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO/United Nations Numerical Designation:** 6.1/1649

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Red, orange, or blue
4.3 **Odor:** Sweet, musty fruity odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor cartridge type face mask for emergencies of short duration, fresh air mask for longer duration, impervious protective gloves, goggles as required, boots and light-colored clothing

5.2 **Symptoms Following Exposure:** Increased urinary output of lead. Large degree of absorption from inhalation or skin contact may cause insomnia, excitability, delirium, coma and death

5.3 **Treatment for Exposure:** Call a physician for any exposure. INHALATION: remove from exposure. INGESTION: no specific antidote. EYES: flush with plenty of water for about 15 min. SKIN: flush with kerosine, wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 - 0.15 mg/m³ (as lead)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Lead poisoning

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin. Toxic absorption through skin may occur

5.10 **Odor Th...** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 89°F = 265°F O.C.
6.2 **Flammable Limits in Air:** None established
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic lead-containing gases are generated in fires
6.6 **Behavior in Fire:** containers may explode
6.7 **Ignition Temperature:** Begins to decompose above 212°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Reacts with oxidizing materials, active metals and rust, but not considered hazardous
7.3 **Stability During Transport:** A self sustaining decomposition occurs if the temperature of the bulk liquid is above 212°F and a flame or hot metal surface serves to ignite the mass. The presence of ethylene dibromide makes the compound stable at 300°F for 15 hrs.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** See Tetraethyl Lead
8.2 **Waterfowl Toxicity:** ...ta not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 E.I. duPont de Nemours & Co. Inc.
Petroleum Chemicals Division
Wilmington, Del. 19898

2 Ethyl Corp.
Industrial Chemicals Division
451 Florida St.
Baton Rouge, La. 70801

3 PPG Industries, Inc.
Houston Chemical Co. Division
One Gateway Center
Pittsburgh, Pa. 15222

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
50-60% mixed lead alkyls
38-36% ethylene dibromide
0-19% ethylene dichloride
2-12% toluene, other solvents, dyes

10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A.X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** >200°F = >93°C = >367°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.5 - 1.7 at 15°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030
13.12 **Latent Heat of Vaporization:** (est.) 101 Btu/lb = 56.2 cal/g = 2.35 × 10⁵ J/kg
13.13 **Heat of Combustion:** (est.) −18,200 Btu/lb = −10,120 cal/g = −424 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

M0123

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NAB — NABAM

Common Synonyms			
EBDC sodium salt Ethylenebis [dithiocarbamic acid], disodium salt Disodium ethylenebis [dithiocarbamate] Chem Bam Lethane	Solid or solution Mixes with water	Colorless to light amber	Slight odor

[illegible] KEEP PEOPLE AWAY

Fire

Not flammable
Poisonous and flammable gases are produced if the solution boils

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
[illegible]
LIQUID OR SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if drunk in water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning; prevent water contamination
Restrict access
Shield if spreading
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chem Bam; Disodium ethylenebis [dithiocarbamate]; Dithane; EBDC sodium salt; Ethylenebis dithiocarbamic acid, disodium salt
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $C_4H_6N_2S_4Na_2$
3.4 **IMCO/United Nations Numerical Designation:** 2771/1709

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or 22% solution in water
4.2 **Color:** Colorless to amber
4.3 **Odor:** Slight sulfide

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask; safety goggles; protective clothing; impervious rubber gloves
5.2 **Symptoms Following Exposure:** Contact with liquid may cause eye and skin irritation; evidence of skin sensitization may develop
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if not breathing, give artificial respiration, preferably mouth-to-mouth; if breathing is difficult, give oxygen; call physician. EYES: flush with plenty of water for at least 15 minutes; call physician. SKIN: wash with soap and water. INGESTION: induce vomiting and have victim drink large quantities of water; call physician
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 oral poison
5.7 **Late Toxicity:** Degradation products may cause [illegible]
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** If water content boils, poisonous hydrogen sulfide and flammable carbon disulfide vapors form
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction unless water is boiling hot, when poisonous hydrogen sulfide and flammable carbon disulfide vapors form
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] 24-hr TLm value for striped bass [illegible] lethal from 0.1 to 10 ppm [illegible] Tests performed in [illegible]
8.2 **Waterfowl Toxicity:** LD [illegible] (one dose, oral)
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

[illegible]
Independence Mall West
Philadelphia, Pa. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 22% solution in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES*

*13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 256.4
13.3 **Boiling Point at 1 atm:** No data (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** No data
*13.6 **Critical Pressure:** No data
13.7 **Specific Gravity:** 1.4 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
*13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
*13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
*13.12 **Latent Heat of Vaporization:** Not pertinent
*13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** No data
13.15 **Heat of Solution:** [illegible]
*13.16 **Heat of Polymerization:** Not pertinent

*Data at [illegible] and 1 atm

[illegible] standard conditions

NOTES

NCT	NAPHTHA: COAL TAR

Common Synonyms
Mixture of coal tar hydrocarbons

Watery liquid Colorless to pale yellow Gasoline-like odor

Floats on water. Irritating vapor is produced.

Fire

Combustible

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to form surface.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mixture of benzene, toluene and xylenes
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation:**

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Like benzene, toluene and xylene

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus and full protective clothing.
5.2 **Symptoms Following Exposure:** Primarily a narcotic causing drowsiness at high concentrations. The symptoms of acute benzene poisoning are the same as those produced by the aromatic hydrocarbons in coal tar naphtha.
5.3 **Treatment for Exposure:** Remove victim to fresh air. Support respiration if necessary. Call physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):**
5.5 **Short-Term Inhalation Limits:**
5.6 **Toxicity by Ingestion:**
5.7 **Late Toxicity:**
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory tract. The effects are temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. If spilled in confined area, the vapors may cause dizziness and asphyxiation.
5.10 **Odor Threshold:**

6 FIRE HAZARDS

6.1 **Flash Point:**
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:**
6.8 **Electrical Hazard:**
6.9 **Burning Rate:**

7. CHEMICAL REACTIVITY

7.1 **Reactivity w Water:** No reaction
7.2 **Reactivity with Common Materials:** Not known
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Koppers Co.
Organic Materials Division
Koppers Bldg.
Pittsburgh, Pa. 15219

Neville Chemical Co.
Neville Island
Pittsburgh, Pa. 15225

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Purity varies with source and distillation range taken.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

A.T.E.S.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transport, 1974:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:**
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:**
13.8 **Liquid Surface Tension:**
13.9 **Liquid-Water Interfacial Tension:**
13.10 **Vapor (Gas) Specific Gravity:** Data not available
13.11 **Ratio of Specific Heats of Vapor (Gas):**
13.12 **Latent Heat of Vaporization:**
13.13 **Heat of Combustion:**
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

NTM

NAPHTHALENE, MOLTEN

Common Synonyms
Naphthalin
Tar camphor

Molten solid | Colorless | Mothballs odor

Solidifies and floats or sinks in water

[illegible]

Fire

Combustible

[illegible]

Exposure

CALL FOR MEDICAL AID
SOLID OR LIQUID
Irritating to skin and eyes.

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Naphthalin
Tar Camphor

3 2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon

3 3 **Chemical Formula:** $C_{10}H_8$

3 4 **IMCO/United Nations Numerical Designation** 4 1 1334

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Coal tar moth balls

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U S Bureau of Mines approved organic vapors canister unit (USEM Type 'O') rubber gloves chemical safety goggles face shield coveralls and/or rubber apron rubber boots or boots

5 2 **Symptoms Following Exposure** Vapors or fumes are irritating to eyes nose and throat and may cause headaches dizziness nausea etc Solid may be irritating to skin

5 3 **Treatment for Exposure:** INHALATION remove to fresh air SKIN OR EYES flushing with plenty of water for at least 15 min remove contaminated clothing immediately call a physician

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 10 ppm

5 5 **Short-Term Inhalation Limits.** 15 ppm for 15 min

5 6 **Toxicity by Ingestion** Grade 2, oral rat LD_{50} = 1780 mg/kg

5 7 **Irritation Toxicity:** Data not available

5 8 **Vapors (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics** Hot liquid will cause severe burn The solid may irritate the skin

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 174°F C C , 190°F O C

6 2 **Flammable Limits in Air** 0 9% 5 9%

6 3 **Fire Extinguishing Agents:** Water fog carbon dioxide dry chemical or foam

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic vapors given off in a fire

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** 979°F

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** 4 3 mm min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Molten naphthalene spatters and foams in contact with water No chemical reaction is involved

7 2 **Reactivity with Common Materials:** None

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** 150 mg/l 96 hr sunfish/TL_m fresh water 1 8 ppm 72 hr fingerling salmon/critical salt water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** (theor) 59 5% 6 days

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Division
Morristown N J 07960

2 Ashland Oil Inc
Ashland Chemical Co Division
Columbus Ohio 43216

3 United States Steel Corp
USS Chemicals Division
525 William Penn Place
Pittsburgh Pa 15230

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure Crude 95%
Pure mp = 176°F
Crude mp = 165 176°F

10 2 **Storage Temperature:** Elevated

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-T-U-A

12. HAZARD CLASSIFICATIONS

*12 1 **Code of Federal Regulations:** ORM A

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight** 128 16

13 3 **Boiling Point at 1 atm:** 424°F = 218°C = 491°K

13 4 **Freezing Point:** 176 4°F = 80 2°C = 353 4°K

13 5 **Critical Temperature.** 887 4°F = 475 2°C = 748 4°K

13 6 **Critical Pressure** 588 psia = 40 0 atm = 3 05 MN/m²

13 7 **Specific Gravity:** 1 145 at 20°C (solid)

13 8 **Liquid Surface Tension** 31 8 dynes/cm = 0 0318 N/m at 100°C

13 9 **Liquid-Water Interfacial Tension** Data not available

13 10 **Vapor (Gas) Specific Gravity.** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** 1 068

13 12 **Latent Heat of Vaporization:** 148 Btu lb = 80 7 cal/g = 3 44 × 10⁵ J/kg

13 13 **Heat of Combustion** −16 720 Btu lb = −9287 cal/g = −388 8 × 10⁵ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 of 16

NOTES

REVISED 1978

NSV NAPHTHA: SOLVENT

Common Synonyms
Petroleum solvent

Watery liquid | Colorless | Gasoline-like odor

Floats on water. Vapor is produced

[illegible]

Fire

Combustible
[illegible]

Exposure

ALL FOR MEDICAL AID

VAPOR
Not irritating to eyes, nose or throat
If inhaled, will cause dizziness or loss of consciousness
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
Flush eyes with plenty of water
IF IN EYES: Hold [illegible] Flush with plenty of water
IF SWALLOWED: [illegible] Induce VOMITING. Have victim drink water [illegible]
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** Light naphtha; Petroleum solvent
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** 3 2 1256

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color** Colorless
4 3 **Odor:** Like kerosene and gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield (as for gasoline)
5 2 **Symptoms Following Exposure:** High concentration of vapors may cause intoxication. If liquid is swallowed it may get into lungs by aspiration, not very irritating to skin or eyes
5 3 **Treatment for Exposure.** INHALATION: remove to fresh air, treat symptoms. INGESTION: do NOT induce vomiting, call a doctor. EYES: flush with water for 15 min. SKIN: wipe off, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5 5 **Short-Term Inhalation Limits:** 500 ppm for 30 min
5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0.5 to 5 g/kg
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause stinging and reddening of skin
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** >100°F C C
6 2 **Flammable Limits in Air:** 0.8% - 5.0%
6 3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature** 444°F
6 8 **Electrical Hazard.** Class I, Group D
6 9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Pennsylvania Refining Co
Butler, Pa 16001
2 Sun Oil Co
St Davids, Pa 19087
3 Union Oil Co
Amsco Division
3100 S Meacham Rd
Palatine, Ill 60067

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Refined solvent, crude light solvent, crude heavy solvent
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm:** 266 - 311°F = 130 - 155°C = 403 - 428°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.85 - 0.87 at 20°C (liquid)
13 8 **Liquid Surface Tension.** 19 - 23 dynes/cm = 0.019 - 0.023 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** 39 - 51 dynes/cm = 0.039 - 0.051 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** (est.) 1.030
13 12 **Latent Heat of Vaporization:** 130 - 150 Btu/lb = 71 - 83 cal/g = 3.0 - 3.4 × 10^5 J/kg
13 13 **Heat of Combustion:** (est.) = -18,200 Btu/lb = -10,100 cal/g = -424 × 10^5 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

NSS NAPHTHA: STODDARD SOLVENT

Common Synonyms
Petroleum solvent
Drycleaner naphtha
Spotting naphtha

Watery liquid | Colorless | Gasoline-like odor

Floats on water

Fire

Combustible

Exposure

CAUTIOUS MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label is required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Drycleaners naphtha; Petroleum solvent; Spotting naphtha
3 2 **Coast Guard Compatibility Classification** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula** Not applicable
3 4 **IMCO-United Nations Numerical Designation:** 3 3 1268

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield (a for gasoline)
5 2 **Symptoms Following Exposure:** High concentration of vapors may cause intoxication If liquid is swallowed it may get into lungs by aspiration not very irritating to skin or eyes
5 3 **Treatment for Exposure:** INHALATION remove patient from exposure treat symptoms INGESTION do NOT induce vomiting Call a doctor EYES flush with water for 15 min SKIN wipe off and wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** 200 ppm
5 5 **Short-Term Inhalation Limits** 500 ppm for 30 min
5 6 **Toxicity by Ingestion.** Grade 2 LD$_{50}$ 5 to 5 g/kg
5 7 **Late Toxicity** None
5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to the eyes and throat
5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Thresholds.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 110°F (C C)
6 2 **Flammable Limits in Air** 0.8% 5.0%
6 3 **Fire Extinguishing Agents.** Foam dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature.** 540°F (est.)
6 8 **Electrical Hazard:** Class I Group D
6 9 **Burning Rate** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Pennsylvania Refining Co
Butler Pa 16001
2 Sun Oil Co
St Davids Pa 19087
3 Exxon Oil Co
Amsco Division
3000 S Meacham Rd
Palatine Ill 60067

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight** Not pertinent
13 3 **Boiling Point at 1 atm:** 320-390°F = 160-199°C = 433-472°K
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.7% at 20°C (liquid)
13 8 **Liquid Surface Tension:** 19-23 dynes/cm = 0.019-0.023 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** 39 51 dynes/cm = 0.039-0.051 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Data not available
13 11 **Ratio of Specific Heats of Vapor (Gas)** (est.) 1.030
13 12 **Latent Heat of Vaporization** 130-150 Btu/lb = 72-83 cal/g = 3.0-3.4 × 10^5 J/kg
13 13 **Heat of Combustion** (est.) −18,200 Btu/lb = −10,100 cal/g = −424 × 10^5 J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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NVM

NAPHTHA: VM & P

(75% NAPHTHA)

Common Synonyms
Petroleum solvent
Light naphtha

Watery liquid | Colorless | Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay out of low areas; ventilate closed spaces before entering.
Stay upwind and use water spray to knock down vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with foam, dry chemical, carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Evacuate area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Light naphtha; Painter's naphtha; Petroleum solvent
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** 3 2 1255

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield (as for gasoline)
5 2 **Symptoms Following Exposure:** Vapor irritates respiratory tract, causes coughing and mild depression. Aspiration causes severe lung irritation with coughing, gagging and rapidly developing pulmonary edema. Ingestion irritates mouth and stomach, causes nausea, vomiting, swelling of abdomen, cardiac arrhythmias.
5 3 **Treatment for Exposure:** INHALATION: maintain respiration if required. INGESTION: do NOT induce vomiting; observe for pneumonia; support if central nervous system depression occurs. ASPIRATION: enforce rest; administer oxygen; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** 500 ppm for 30 min
5 6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ 5 to 15 g/kg
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 20–58°F, C.C.
6 2 **Flammable Limits in Air:** 0.9% – 6.7%
6 3 **Fire Extinguishing Agents:** Foam, carbon dioxide or dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Vapor is heavier than air and may travel long distances to a source of ignition and flash back
6 7 **Ignition Temperature:** 450°F
6 8 **Electrical Hazard:** Class I, Group D
6 9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Pennsylvania Refining Co.
Butler, Pa. 16001
2. Sun Oil Co.
St. Davids, Pa. 19087
3. Union Oil Co.
Amsco Division
3100 S. Meacham Rd.
Palatine, Ill. 60067

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Petroleum hydrocarbons (90%) plus aromatic hydrocarbons such as benzene and toluene (10%)
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V T L V-W

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** 200–300°F = 93–149°C = 366–422°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.75 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 19.23 dynes/cm = 0.019 0.023 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** 39.51 dynes/cm = 0.039 0.051 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Data not available
13 11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030
13 12 **Latent Heat of Vaporization:** 130–150 Btu/lb = 71 Mcal/g = 30.3–3.4 × 10^{4} J/kg
13 13 **Heat of Combustion:** (est.) –18 200 Btu/lb = –10 100 cal/g = –424 × 10^{4} J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

NTI

NAPHTHENIC ACIDS

Common Synonyms	Liquid	Gold to black
	May float or sink in water	

Avoid contact with liquid and vapor. Keep people away.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Combustible

Extinguish with dry chemicals, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give liquid. Seek medical aid.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms.

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula**

$R\text{-}(CR_2CR_2CR_2\text{-}C)R(CH_{in}COOH$

where n = 2 6

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Golden to black

4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses or face mask.

5 2 **Symptoms Following Exposure:** Principal effect is that of mild primary irritation when encountered in high concentrations. Inhalation of vapor causes coughing. Liquid is moderately irritating to eyes and slightly to moderately irritating to skin; excessive exposure could result in dermatitis.

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. INGESTION: give large amounts of water. EYES: flush with water until irritation subsides. SKIN: wash with soap and water; remove contaminated clothing and launder before reuse.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Oral LD_{50} = 1000 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.

5 10 **Odor Threshold.** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** 300°F OC

6 2 **Flammable Limits in Air:** 1 0% (LEL)

6 3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products.**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard.** Data not available

6 9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
< 50 ppm/48 60 hr crayfish lethal fresh water
< 6 ppm/96 hr bluegill TL_m fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (dOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Exxon Chemical Co
1333 West Loop South
Houston, Texas 77027

2 Eastman Organic Chemicals
Rochester, N Y 14650

3 Sun Oil Co
1608 Walnut St
Philadelphia, Pa 19103

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial 100%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	4
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 200 250 (mixture)

13 3 **Boiling Point at 1 atm:** 270 470°F = 132 243°C = 405 516°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 982 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

NAO	# 1-NAPHTHYLAMINE

Common Synonyms			
1-Aminonaphthalene alpha-Naphthylamine	Solid	Light to dark brown	Weak ammonia-like odor
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear face shield and self-contained breathing apparatus (pressure-demand)
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Irritating gases are produced when heated
Extinguish with water

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes
Wear self-contained breathing apparatus (pressure-demand)
Full protective clothing including gloves
IF INHALED Remove victim to fresh air
IF SWALLOWED Do not induce vomiting Give water
Induce vomiting and have victim drink water
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS Do not induce vomiting Keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

None required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1-Aminonaphthalene; alpha-Naphthylamine
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $C_{10}H_9N$
3 4 **IMCO/United Nations Numerical Designation:** 6.1 1650

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Tan to brown, darkens on storage
4 3 **Odor:** Characteristic amine

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Complete protection for respirators, system, eyes and skin
5 2 **Symptoms Following Exposure:** Inhalation may cause cyanosis (blue color in lips and under finger nails). Contact with liquid causes local irritation of eyes. Neither ingestion nor contact with skin produces any recognized immediate effects.
5 3 **Treatment for Exposure:** *Persons undergoing severe exposure to this compound should have continuing medical attention for possible development of cancer.* INHALATION: obtain medical attention for cyanosis. EYES: flush with water for at least 15 min. SKIN: wash carefully with soap and water. INGESTION: get medical attention.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 779 mg/kg (rat); 4,000 mg/kg (mammal)
5 7 **Late Toxicity:** Considered cancer producing particularly since it may contain up to 0.5% of 2-naphthylamine
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** (combustible solid) 315°F C.C. (molten solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents.** Water, dry chemical, carbon dioxide, foam
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products.** Toxic nitrogen oxides are produced in a fire
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 West Saint Paul Ave
Milwaukee, Wis. 53233

2 Eastman Kodak Co
Eastman Organic Chemicals
Rochester, N.Y. 14650

3 E. I. duPont de Nemours & Co
Organic Chemicals Dept.
Dyes and Chemicals Division
Wilmington, Del. 19898

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure, Technical
10 2 **Storage Temperature:** Cool ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open. Store containers in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 143.2
13 3 **Boiling Point at 1 atm:** 572°F = 300°C = 573°K
13 4 **Freezing Point:** 122°F = 50°C = 323°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.12 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** −15,290 Btu/lb = −8,495 cal/g = −355.4 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 1 and 4)

NOTES

NHX — NEOHEXANE

Common Synonyms

2,2-Dimethylbutane

Liquid | Colorless | Gasoline like odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause dizziness, coughing, or difficult breathing

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,2-Dimethylbutane

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula.** $CH_3C(CH_3)_2CH_2CH_3$

3.4 **IMCO/United Nations Numerical Designation:** 3.1/1208

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied apparatus or organic vapor cartridge, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes dizziness, nausea and vomiting; concentrated vapor may cause unconsciousness and collapse. Contact with liquid causes irritation of eyes; repeated contact may produce irritation of skin. Ingestion causes irritation of stomach. Aspiration causes severe lung irritation; rapidly developing pulmonary edema and central nervous system excitement followed by depression.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure; if breathing has stopped, begin artificial respiration; call a physician. EYES: flush with water for 15 min.; call physician if needed. SKIN: flush well with water; then wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs; call a doctor. ASPIRATION: enforce bed rest; give oxygen; get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** −54°F C.C.

6.2 **Flammable Limits in Air:** 1.2% - 7.0%

6.3 **Fire Extinguishing Agents.** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** 797°F

6.8 **Electrical Hazard.** Data not available

6.9 **Burning Rate:** 9.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville, Okla. 74003

2. Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, Wis. 53233

3. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Research 99.9%
Pure 99.9% Technical 96-97%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

V T L A W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 86.2

13.3 **Boiling Point at 1 atm:** 121.5°F = 49.7°C = 322.9°K

13.4 **Freezing Point.** −147.5°F = −99.9°C = 173.3°K

13.5 **Critical Temperature:** 420.1°F = 215.6°C = 488.8°K

13.6 **Critical Pressure:** 447 psia = 30.4 atm = 3.08 MN/m²

13.7 **Specific Gravity:** 0.649 at 20°C (liquid)

13.8 **Liquid Surface Tension.** 16.3 dynes/cm = 0.0163 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.** 38 dynes/cm = 0.038 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 3.0

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.064 at 16°C

13.12 **Latent Heat of Vaporization.** 144 Btu/lb = 72.9 cal/g = 3.05 × 10⁵ J/kg

13.13 **Heat of Combustion:** −19,310 Btu/lb = −10,730 cal/g = −449.9 × 10⁵ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page C-446-4)

NOTES

NKA NICKEL ACETATE

Common Synonyms
Nickel acetate tetrahydrate
Acetic acid, Nickel (II) salt
Nickelous acetate

Solid | Dull green | Odorless

Sinks and mixes slowly with water

Avoid contact with solid and dust. Keep people away.
No discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
If in eyes, hold eyelids apart and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: hold eyelids apart and flush with plenty of water.
IF SWALLOWED: and victim is CONSCIOUS, have victim drink water (two glasses).
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do not induce vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Acetic acid, nickel(2+) salt
Nickel acetate tetrahydrate
Nickelous acetate

3.2 **Coast Guard Compatibility Classification.** Not listed.

3.3 **Chemical Formula:** $Ni(C_2H_3O_2)_2 \cdot 4H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed.

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Dull green

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu. Mines approved respirator, rubber gloves, safety goggles, protective clothing.

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes vomiting. Contact with eyes causes irritation. May cause dermatitis on contact with skin.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water. SKIN: wash with soap and water. Get physician if irritation persists.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ (as Ni) (proposed)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 g/kg

5.7 **Late Toxicity:** Possible lung cancer

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Non-pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. American Hoechst Corp.
Chemicals and Plastics Div.
Somerville, N.J. 08876

2. The HarshawChemical Co.
1945 E. 97th St.
Cleveland, Ohio

3. J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99% Reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
Solid

13.2 **Molecular Weight:** 248.86

13.3 **Boiling Point at 1 atm.** Non-pertinent (decomposes)

13.4 **Freezing Point:** Non-pertinent

13.5 **Critical Temperature:** Non-pertinent

13.6 **Critical Pressure:** Non-pertinent

13.7 **Specific Gravity:** 1.74 at 20°C (solid)

13.8 **Liquid Surface Tension** Non-pertinent

13.9 **Liquid-Water Interfacial Tension:**
Non-pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Non-pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Non-pertinent

13.12 **Latent Heat of Vaporization:**
Non-pertinent

13.13 **Heat of Combustion:** Non-pertinent

13.14 **Heat of Decomposition** Non-pertinent

13.15 **Heat of Solution.** Non-pertinent

13.16 **Heat of Polymerization:** Non-pertinent

Continued on page NKA-A

NOTES

NAS

NICKEL AMMONIUM SULFATE

Common Synonyms	Solid	Dark green blue	Odorless
Ammonium nickel sulfate Ammonium nickel sulfate (1:1:2) Nickel ammonium sulfate hexahydrate	Sinks and mixes slowly with water		

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficulty breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting IF IN EYES IF SWALLOWED IF INHALED ON SKIN ON CLOTHING
Water Pollution	Effect of low concentrations on aquatic life unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium disulfate nickelate (II) Ammonium nickel sulfate Nickel ammonium sulfate hexahydrate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $NiSO_4 \cdot NH_4SO_4 \cdot 6H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Dark blue green

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu Mines approved respirator, rubber gloves, face shield or safety goggles, protective clothing

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes vomiting. Contact with eyes causes irritation. Contact with skin may cause dermatitis

5.3 **Treatment for Exposure:** INHALATION: move to fresh air, get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water for at least 15 min., get medical attention if irritation persists. SKIN: wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ as Ni

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 (Rat) 50 mg/kg

5.7 **Late Toxicity:** Possible lung cancer

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 0 ppm as Ni daphnia magna deleterious effect fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. J T Baker Chemical Co
   Phillipsburg N J 08865
2. McGean Chemical Co
   1250 Terminal Tower
   Cleveland, Ohio 44113
3. Gaylord Schlesinger Chemical Mfg C
   584 Mineola Ave
   Carle Place N Y 11514

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Reagent
Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NX

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 395.00

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.92 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5NAS-A

NOTES

NBR	# NICKEL BROMIDE

Common Synonyms			
Nickel bromide trihydrate	Solid	Yellowish-green	Odorless
	Sinks and mixes with water		

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing and difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Nickel bromide trihydrate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $NiBr_2 \cdot 3H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Yellowish green
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bu Mines approved respirator, rubber gloves, face shield or safety goggles, protective clothing
5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes irritation. If large amounts is swallowed and not thrown up it can cause drowsiness and other symptoms of bromide poisoning. Dust irritates eyes and may cause dermatitis on contact with skin.
5 3 **Treatment for Exposure:** INHALATION move to fresh air, get medical attention if exposure has been severe. INGESTION give large amounts of water. EYES flush with water for at least 15 min. SKIN wash with soap and water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m (as nickel)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 - 5 g/kg
5 7 **Late Toxicity:** Possible lung cancer
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Non flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Irritating hydrogen bromide vapors may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 D F Goldsmith Chemical and Metal Co
500 Pitner Ave
Evanston, Ill 60202

2 Gallard-Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

Ventron Corp
PO Box 159
Beverly, Mass 01915

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Reagent
Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

NN

12. HAZARD CLASSIFICATIONS

12 1 **Coast Guard, Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 272.6
13 3 **Boiling Point at 1 atm:** No pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (test 14 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

NKC	# NICKEL CARBONYL

Common Synonyms

Nickel tetracarbonyl

Liquid Colorless to yellow Musty, stale odor

Sinks in water. Poisonous flammable vapor is produced.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning. Poison. High flammability.
If contaminant: Water contaminant.
Restrict access.
Evacuate area.
Should be removed.
Chemical and physical treatment.

2 LABELS





3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Nickel tetracarbonyl
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $Ni(CO)_4$
3 4 **IMCO/United Nations Numerical Designation:** UN 1259

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless to yellow
4 3 **Odor:** Musty characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus; complete protective clothing.

5 2 **Symptoms Following Exposure:** Inhalation causes giddiness, headache, shortness of breath, vomiting. If victim is removed from exposure, symptoms may disappear but recur 12-36 hours later along with blue pallor of skin, fever and cough; death may occur. Ingestion or contact with skin may also produce these symptoms. Abnormal nickel content of urine and blood is a measure of the severity of exposure. Contact of liquid with eyes causes severe irritation.

5 3 **Treatment for Exposure:** *Medical help must be obtained following any exposures to vapor or liquid.* INHALATION: oral administration of sodium diethyldithiocarbamate trihydrate (Dithiocarb); complete bed rest and positive pressure oxygen are indicated for pulmonary edema; treatment otherwise is symptomatic. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: do NOT induce vomiting.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.001 ppm

5 5 **Short-Term Inhalation Limits:** 0.04 ppm for 5 min

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** May produce cancer

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5 10 **Odor Threshold:** 1 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** < −4°F (C)
6 2 **Flammable Limits in Air:** 2- (11)
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used:** Data not available
6 5 **Special Hazards of Combustion Products:** Unusually toxic gases formed by incomplete combustion
6 6 **Behavior in Fire:** Containers may explode when heated
6 7 **Ignition Temperature:** <200°F (vapor)
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 2.7 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable below 100°C
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Pressure Chemical Company
4619 Stellman Street
Pittsburgh, Pa. 15201

2 Gallard-Schlesinger Chemical Mfg. Co.
Atomergic Chemetals Division
584 Mineola Ave.
Carle Place, L. I., N. Y. 11514

3 Matheson Gas Products Co.
East Rutherford, N. J. 07073

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99.9+ %
10 2 **Storage Temperature:** Cool ambient
10 3 **Inert Atmosphere:** Carbon monoxide at 15 psi; carbon dioxide
10 4 **Venting:** Cylinders must be stored in a well-ventilated area

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X X X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicants	
Aquatic Toxicants	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	3
Reactivity (Yellow)	1
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 170.7
13 3 **Boiling Point at 1 atm:** 109°F = 43°C = 316°K
13 4 **Freezing Point:** −13°F = −25°C = 248°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.322 at 17°C (liquid)
13 8 **Liquid Surface Tension:** 15.9 dynes/cm = 0.0159 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** 5.9
13 11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13 12 **Latent Heat of Vaporization:** 72 Btu/lb = 40 cal/g = 1.7 × 10⁵ J/kg
13 13 **Heat of Combustion:** −2970 Btu/lb = −1650 cal/g = −69.0 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

NCL	# NICKEL CHLORIDE

Common Synonyms			
Nickel chloride hexahydrate	Solid	Green	Odorless
	Sinks and mixes with water		

[illegible]

Fire

Not flammable

Exposure

[illegible] FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Nickel chloride hexahydrate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $NiCl_2 \cdot 6H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Green
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, protective gloves, Bu. Mines approved respirator, protective clothing
5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin
5 3 **Treatment for Exposure:** INHALATION: move to fresh air, get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with copious of water for at least 15 min. SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³ (as nickel)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0.5 g/kg
5 7 **Late Toxicity:** Possible lung cancer
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent.
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** No pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
259 mg/l/* minnow fundulus survived salt water
518 ppm/96 hr fathead minnow TLm soft water
424 ppm 96 hr fathead minnow TLm hard water
*Time period not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Texaco Chemicals Inc
Intermediates Div
Turner Place, P O Box 2
Piscataway, N J 08854

2 The Harshaw Chemical Co
1945 East 97 Street
Cleveland, Ohio 44106

3 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1057R
Morristown, N J 07960

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 237.7
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 3.55 at 15°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** 4.9 Btu/lb = 4.9 cal/g = 0.21 × 10³ J/kg
13 15 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

NCN	# NICKEL CYANIDE

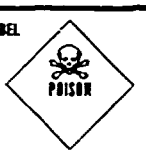
Common Synonyms	Solid — Light green or yellow-brown — Weak almond odor Sinks in water
	[illegible]
Fire	Not flammable
Exposure	[illegible] DUST POISONOUS IF INHALED Irritating to eyes, nose and throat [illegible] SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-6)

Issue warning: prevent water contact
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $Ni(CN)_2 \cdot nH_2O$ n=0,2,4
3 4 **IMCO/United Nations Numerical Designation:** 1653

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Anhydrous yellow-brown, hydrates pale green
4 3 **Odor:** Weak characteristic cyanide

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, rubber gloves, goggles
5 2 **Symptoms Following Exposure:** Inhalation of dust or ingestion may produce nose irritation, salivation, numbness of throat, anxiety, irregular respiration, rapid pulse, convulsions, loss of consciousness, paralysis, death
5 3 **Treatment for Exposure:** Get medical help; first aid treatment must be prompt; the compound is much less toxic than sodium or potassium cyanides. No cyanide poisoning is a postulate. EYES or SKIN: flush with water; avoid getting solution in mouth. INGESTION: start artificial respiration if breathing has stopped; inhalation of amyl nitrite and intravenous doses of sodium nitrite and sodium thiosulfate should be administered by physician
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** 5 mg/m³ for 30 min (as cyanide)
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** >100 mg/l* Fish: Not expected moderately alkaline water
In acid water, releases hydrogen cyanide which is fatal to all species
*Time period not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Plastic and Rubber Inc.
[illegible] Northern Boulevard
Hicksville, N.Y. 11801

2 Varlacoid Chemical Co.
666 N. Front Street
Elizabeth, N.J. 07202

Fielding Chemical Co.
Forrest and Halladay Streets
Jersey City, N.J. 07305

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Sealed containers in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poison, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** Mixture
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.4 at 24°C (anhyd.)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and)

NOTES

NFB	# NICKEL FLUOROBORATE

Common Synonyms
Nickel(II) fluoborate
Nickel fluoborate solution

Liquid — Green

Sink and mixes with water

Fire	Not flammable
Exposure	VAPOR Irritating to eyes, nose and throat Harmful if inhaled LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard data is required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nickel(II) fluoborate; Nickel fluoborate solution

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $NiB_2F_8H_4O_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Clear green

4.3 **Odor:** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety glasses and face shield; rubber gloves; rubber apron

5.2 **Symptoms Following Exposure:** Ingestion causes irritation of mouth, throat, stomach. Liquid or vapor irritates eyes and skin and may cause dermatitis

5.3 **Treatment for Exposure:** INGESTION: give large amounts of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ as nickel

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; LD$_{50}$ 0.5 - 5 g/kg

5.7 **Late Toxicity:** Possible lung cancer

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp
P. O. Box 1057R
Morristown, N. J. 07960
2. The Harshaw Chemical Co
1945 East 97 St
Cleveland, Ohio 44106
3. Harstan Chemical Corp
1247 38 Street
Brooklyn, N. Y. 11218

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 44.2 - 45.2% in water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

N F

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Mixture

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.9 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7-NFB-1

NOTES

NFM NICKEL FORMATE

Common Synonyms			
Nickel formate dihydrate	Solid	Green	Odorless
	Sinks and mixes with water		

[illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

[illegible]

Water Pollution

Effect of low [illegible] **concentrations on aquatic life is unknown**
May be dang [illegible] **osit enters water intakes**

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Nickel formate dihydrate
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula** $Ni(HCO_2)_2 \cdot 2H_2O$
3 4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color** Greenish
4 3 **Odor** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Bu Mines approved respirator, rubber gloves, face shield or safety goggles, protective clothing
5 2 **Symptoms Following Exposure** Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin.
5 3 **Treatment for Exposure** INHALATION: move to fresh air, get medical attention if exposure has been severe. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 mg/m³ (as Ni)
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 0.5 g/kg
5 7 **Late Toxicity.** Possible lung cancer
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air.** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Irritating formic acid vapors may form in fire
6 6 **Behavior in Fire.**
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

McGean Chemical Co
1350 Terminal Tower
Cleveland, Ohio 44113

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SN

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** 184.8
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.15 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on page 1 card b)

NOTES

NNT NICKEL NITRATE

Common Synonyms
Nickel nitrate hexahydrate

Solid | Green | Odorless

Sinks and mixes with water

Avoid contact with solid and dust. Keep people away.
Stop leak if no fire.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Runoff to sewer may cause pollution

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If in eyes, hold eyelids open and flush with plenty of water
If not breathing, has stopped, give artificial respiration
If breathing is difficult, give oxygen
SOLID
Irritating to eyes
If swallowed, may cause nausea and vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS
Do not induce vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify operators of downstream water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Nickel nitrate hexahydrate
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** $Ni(NO_3)_2 \cdot 6H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** Green
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bu Mines approved respirator, rubber gloves, face shield or safety goggles, protective clothing
5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin
5 3 **Treatment for Exposure:** INHALATION: move to fresh air, get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water for at least 15 min. SKIN: wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 mg/m³ (as nickel)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 g/kg
5 7 **Late Toxicity:** Possible lung cancer
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable but may intensify fire
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen may form in fire
6 6 **Behavior in Fire.** May increase intensity of fire if in contact with combustible material
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** Contact of solid with wood or paper may cause fires
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
2.44 ppm/* /stickleback/threshold conc. / tap water
0.8 ppm/10 days/stickleback/11 m/ fresh water
*Time period not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 The Harshaw Chemical Co
1945 East 97 St
Cleveland, Ohio 44106

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown, N J 07960

3 McGean Chemical Co
1250 Terminal Tower
Cleveland, Ohio 44113

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Purified 99.1%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification*	
Health Hazard (Blue)	0	1
Flammability (Red)	0	0
Reactivity (Yellow)	0	0
	OXY	OXY

*First column refers to no fire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** 290.8
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.05 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heat of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** 47 Btu/lb = 26 cal/g = 1.1 × 10⁵ J/kg
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

NKS	# NICKEL SULFATE

Common Synonyms			
Nickelous sulfate	Solid crystals	Pale green	Odorless
	Sinks and mixes slowly with water		

Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids [illegible] flush with plenty of water

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Nickelous sulfate
3 2 **Coast Guard Compatibility Classification.** Not applicable
3 3 **Chemical Formula:** $NiSO_4$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color:** Pale green
4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles, gloves
5 2 **Symptoms Following Exposure:** Dermatitis
5 3 **Treatment for Exposure:** Wash all affected parts with plenty of water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 mg/m³
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Nose and lung cancer
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** Repeated contact can cause dermatitis
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
640 ppm/48 hr rainbow trout/TL_m fresh water
139 ppm/48 hr prawn LC salt water
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Chemetron Corp
Inorganic Chemicals Division
1290 Terminal Tower
Cleveland, Ohio 44113

2 Mallinckrodt Chemical Works
Industrial Chemicals Division
Second and Mallinckrodt Sts
St Louis, Mo 63160

3 Shepherd Chemical Co
4900 Beech St
Cincinnati, Ohio 45212

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical reagent
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 154.78
13 3 **Boiling Point at 1 atm:** Decomposes
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity** 3.68 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

NIC — NICOTINE

Common Synonyms			
1-Methyl-2-(3-pyridyl) pyrrolidine 3-(1-methyl-2-pyrrolidyl) pyridine	Liquid	Colorless to brown	Fishy odor
	Mixes with water		

[illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED WHEN HEATED
[illegible]

Exposure

[illegible] FOR MEDICAL AID
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes
[illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: poison, water contaminant
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** 1-Methyl-2-(3-pyridyl) pyrrolidine; 3-(1-Methyl-2-pyrrolidyl) pyridine

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula.** [illegible]

3.4 **IMCO/United Nations Numerical Designation.** 6.1/1654

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to brown

4.3 **Odor.** Fishy; develops a pyridine or tobacco-like odor on exposure to air

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Goggles or face shield; rubber gloves; protective clothing

5.2 **Symptoms Following Exposure:** Inhalation: [illegible] burning sensation in mouth and throat; nausea; headache; [illegible]. Contact with liquid irritates eyes and causes local irritation of skin. Can be absorbed through skin in toxic amounts. Ingestion causes burning of mouth and stomach; vomiting; excitement; faintness; paralysis of lungs.

5.3 **Treatment for Exposure.** *Speed of treatment is important following exposure to this compound. Ingestion of as little as 40 mg can be fatal.* EYES: flush with water for at least 15 min. SKIN: wash thoroughly and immediately with cold water. INGESTION: call for physician at once; give 6 tablespoons of activated charcoal as a slurry in water; give artificial respiration if breathing has stopped.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** [illegible]

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Oral [illegible] LD_{50} = 53 mg/kg (rat); 1 mg/kg (human)

5.7 **Late Toxicity:** Birth defects (experimental animals)

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically [illegible] to the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** Data not available

6.2 **Flammable Limits in Air.** [illegible]

6.3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products.** Smoke may contain toxic vapors of unburned compound

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature.** 471°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** 3.29 ppm/* fish/toxic/fresh water
*Time period not specified

8.2 **Waterfowl Toxicity:** LD_{50} = 987 mg/kg

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Chemical Formulators Inc
   Box 26
   Nitro, W. Va. 25143
2. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N. Y. 14650
3. Pfaltz and Bauer, Inc.
   226 04 Northern Boulevard
   Flushing, N. Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 93–98%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

XPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	4
Water Pollution	
Human Toxicity	
Aquatic Toxicity	4
Aesthetic Effect	4
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 162.2

13.3 **Boiling Point at 1 atm** (decomposes): 482°F = 250°C = 523°K

13.4 **Freezing Point.** Not pertinent

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.01 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 35.61 dynes/cm = 0.03561 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** (est.): 20 dynes/cm = 0.020 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

(Continued on page 5-nn-A)

NOTES

NCS

NICOTINE SULFATE

Common Synonyms	Solid or solution	White to light brown solid or colorless solution	Odorless solid or tobacco colored solution
Neutral nicotine sulfate Black Leaf 40 (40% water solution)	Mixes with water		

AVOID CONTACT WITH SOLID AND SOLUTION KEEP PEOPLE AWAY

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

VAPOR OR DUST
POISONOUS IF INHALED

LIQUID OR SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, poison, water contaminant
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Black Leaf 40 (40% water solution) Neutral nicotine sulfate

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $(C_{10}H_{14}N_2)_2 \cdot H_2SO_4$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1658

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or water solution

4 2 **Color:** Solid is off white to yellow tan darkens on exposure to light Water solution may be colorless

4 3 **Odor:** Solid is odorless water solution has odor of tobacco

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask rubber gloves

5 2 **Symptoms Following Exposure** Inhalation causes irritation of nose and throat Liquid irritates eyes and (on prolonged contact) skin Ingestion causes burning of mouth and stomach vomiting excitement faintness paralysis of lungs

5 3 **Treatment for Exposure** EYES flush with water SKIN wash thoroughly and immediately with water INGESTION call for medical aid induce immediate and repeated vomiting perform gastric lavage with dilute (1:1000) solution of potassium permanganate or activated charcoal in water or milk apply artificial respiration if breathing has stopped

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} - 55 mg/kg/rats

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Nonflammable as solid or water solution

6 2 **Flammable Limits in Air.** Not pertinent

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic decomposition products are released in a fire

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 1 29 ppm/* fish tox s fresh water (for nicotine)
*Time period not specified

8 2 **Waterfowl Toxicity:** LD_{50} = 567 mg/kg (for nicotine)

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Chemical Formulators Inc
Box 26
Nitro W Va 25143

2 Prentiss Drug and Chemical Co
363 Seventh Ave
New York N Y 10001

3 Pfizer and Bauer Inc
126-04 Northern Boulevard
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Solid Commercial Solution 40%

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3)

NN

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poison Class B

12 2 **NAS Hazard Rating for Bulk Water Transports** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 422 5

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 15 at 30°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

NTL — NITRALIN

Common Synonyms

4-(Methylsulfonyl)-2,6-dinitro-N,N-dipropylaniline
Planavin

Solid | Light yellow to orange | Mild odor

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear goggles, self-contained breathing apparatus, and rubber suit
Notify local health and pollution control agencies
Keep chemical from entering water intakes
Isolate and remove discarded material
Notify local health and pollution control agencies

Fire

Combustible
Irritating gases are produced when heated
Containers may explode in fire
Use water spray to keep fire-exposed containers cool
Dike and collect water used to fight fire

Exposure

CALL FOR MEDICAL AID

DUST

POISONOUS IF INHALED

Wear dust respirator
Wear protective clothing

SOLID

POISONOUS IF SWALLOWED
Irritating to skin and eyes

Wear dust respirator
Wear protective clothing
EYES: Immediately flush with plenty of water for at least 15 minutes. Get medical attention.
SWALLOWED: Induce vomiting by giving two glasses of water or milk and sticking finger down throat. Get medical attention.
SWALLOWED: Do not induce vomiting. Seek medical attention.
SKIN CONTACT: Wash with soap and water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 4-(methylsulfonyl)-2,6-dinitro-N,N-dipropylaniline Planavin
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $C_{13}H_{19}N_3O_6S$
3 4 **IMCO/United Nations Numerical Designation:** 6.1 1699

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Light yellow to orange
4 3 **Odor:** Mild chemical

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, rubber gloves
5 2 **Symptoms Following Exposure:** Dust irritates eyes. Other forms of exposure produce no observable symptoms
5 3 **Treatment for Exposure:** No cases of clinical toxicity on record. Supportive and symptomatic medical treatment recommended if massive overexposure occurs. EYES: flush with water if irritation occurs. SKIN: wash with soap and water. INGESTION: induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 2; oral $LD_{50} > 2{,}000$ mg/kg (rat)
5 7 **Late Toxicity:** None observed
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents.** Water
6 4 **Fire Extinguishing Agents Not to be Used.** Data not available
6 5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur and nitrogen are formed in fire
6 6 **Behavior in Fire:** Decomposes vigorously in a self-sustaining reaction at or above 225°C
6 7 **Ignition Temperature:** 435°F
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 27 ppm 96 hr rainbow trout TLm fresh water
1 ppm 96 hr oysters: no effect salt water
8 2 **Waterfowl Toxicity:** No toxicity after 2,000 mg/kg (ducks)
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Shell Chemical Company
Agricultural Division
2401 Crow Canyon Road
San Ramon, Calif. 94583

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 94%
Wettable powder 75%
Emulsifiable concentrate
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirements
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not Listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 345.2
13 3 **Boiling Point at 1 atm.** (decomposes) >437°F = >225°C = >498°K
13 4 **Freezing Point:** 304°F = 151°C = 424 K
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est.) >1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** Data not available
13 14 **Heat of Decomposition:** −450 Btu/lb = −250 cal/g = -10.5×10^5 J/kg
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 3 and 4

NOTES

NAC	# NITRIC ACID

Common Synonyms

Watery liquid Colorless to light brown Choking odor

Sinks and mixes with water. Harmful vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR.

Fire

Not flammable
May cause fire on contact with combustibles
Flammable gas may be formed on contact with metals
Poisonous gases are produced when heated

Exposure

CALL FOR MEDICAL AID

VAPOR
Will burn eyes, nose and throat.
If inhaled, will cause difficult breathing or loss of consciousness.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

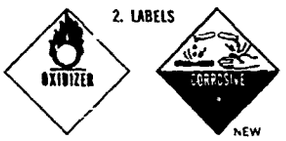
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Isolate water for corrosive
Restrict access
Evacuate area
Disperse and flush

2. LABELS



NEW

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Nitric acid
3.3 **Chemical Formula:** HNO_3
3.4 **IMCO United Nations Numerical Designation:** NO 2031

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Acrid, sweet to acrid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air mask, rubber acid suit, hood, boots and gloves, chemical goggles, safety shower and eye bath
5.2 **Symptoms Following Exposure:** Vapors irritate eyes and respiratory tract; lung injury may not become apparent for several hours following exposure. Liquid may cause severe burns to eyes and skin.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, administer oxygen if breathing is difficult, give artificial respiration if required. INGESTION: drink large volumes of water, do NOT induce vomiting. SKIN OR EYES: flush with water for at least 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm
5.5 **Short-Term Inhalation Limits:** 10 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 3. LD$_{50}$: 430 mg/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** 5 to 885. Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 99+. Vapors cause severe irritation of eye and throat and can cause eye and lung injury. Does not accumulate even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very dangerous to the eyes.
5.10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Use water on adjacent fires
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** May give off poisonous oxides of nitrogen and acid fumes when heated in fires.
6.6 **Behavior in Fire:** Decomposes and gives off poisonous oxides of nitrogen
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** May heat up on mixing, but explosion or formation of steam unlikely.
7.2 **Reactivity with Common Materials:** Very corrosive to wood, paper, cloth and most metals. Toxic red oxides of nitrogen are formed.
7.3 **Stability During Transport:** When heated may give off toxic red oxides of nitrogen.
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 72 ppm 96 hr mosquito fish TL$_m$ fresh water; 180-1000 ppm 48 hr oceanic IC$_{50}$ salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Agricultural Division
Morristown, N.J. 07960
2. E.I. duPont de Nemours & Co., Inc.
Explosives Dept.
Wilmington, Del. 19898
3. Hercules, Inc.
Explosives & Chemical Propulsion Dept.
Bessemer, Ala. 35020

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Various grades 42-98%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open or pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizer
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicants	3
Aquatic Toxicants	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** 181.0°F = 83.0°C = 356.1°K
13.4 **Freezing Point:** -50°F = -45.5°C = 227.7°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.49 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not known
13.12 **Latent Heat of Vaporization:** 214 Btu/lb = 119 cal/g = 4.98 × 10^5 J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -205 Btu/lb = -114 cal/g = -4.76 × 10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

REVISED 1978

NTX	# NITRIC OXIDE

Common Synonyms

Mononitrogen monoxide
Nitrogen monoxide

Compressed gas Colorless Sharp unpleasant odor

Reacts with water. Poisonous red brown vapor cloud is produced

Fire

Not flammable

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, air contaminant
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Mononitrogen monoxide
Nitrogen monoxide

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** NO

3 4 **IMCO/United Nations Numerical Designation:** 2 1660

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Compressed gas

4 2 **Color:** Colorless but becomes red brown on contact with air because of formation of nitrogen tetroxide

4 3 **Odor:** (nitrogen tetroxide) Pungent acrid mildly irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus or gas mask with universal canister

5 2 **Symptoms Following Exposure:** Continued inhalation of low concentrations causes chronic irritation, cough, headache, corrosion of teeth, loss of strength, symptoms from overexposure to higher concentrations which may be delayed for 6–24 hours include irritation of nose and throat, tightness in chest, difficult breathing, pallor, loss of consciousness, and death. pulmonary edema occurs. If patient recovers, pneumonia may develop

5 3 **Treatment for Exposure:** *Get medical attention at once following inhalation of this gas.* INHALATION: if breathing has stopped, give artificial respiration with 100% oxygen, keep victim quiet and warm. Keep head and chest lower than hips, to aid in drainage from lungs. Alert physician to possibility of delayed pulmonary edema during 6–24 hours.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm

5 5 **Short-Term Inhalation Limits:** ≤100 ppm: 60 min.; ≤150 ppm: 30 min.; ≤200 ppm: 5 min.

5 6 **Toxicity by Ingestion:** Not pertinent (gas at normal temperatures)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (nonflammable compressed gas)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Supports combustion so all fires burn more vigorously

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts with water to form nitrous acid. The reaction is not violent

7 2 **Reactivity with Common Materials:** Reacts rapidly with air to form nitrogen tetroxide; see this compound

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flood with water; rinse with sodium bicarbonate or lime solution

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Not pertinent

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Matheson Gas Products
P O Box 85
East Rutherford, N J 07073

2 Union Carbide Corporation
Linde Division
Morristown, N J 07605

3 Air Products and Chemicals, Inc.
Specialty Gas Department
P O Box 538
Allentown, Pa 18105

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** C P 99+%

10 2 **Storage Temperature:** Cool, ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief. Cylinders must be in well ventilated area

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous Class A

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Gas

13 2 **Molecular Weight:** 30.0

13 3 **Boiling Point at 1 atm:** −241.1°F = −151.7°C = 121.5°K

13 4 **Freezing Point:** −262.3°F = −163.6°C = 109.6°K

13 5 **Critical Temperature:** 347°F = 453°C = 180°K

13 6 **Critical Pressure:** 940 psia = 64 atm = 6.5 MN/m²

13 7 **Specific Gravity:** Not pertinent

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 1.5 (nitrogen dioxide)

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.400 at 15°C

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 25°C Btu/lb = −143 cal/g = −5.98 × 10³ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and A

NOTES

NAA	NITRILOTRIACETIC ACID AND SALTS

Common Synonyms
Triglycine
NTA
Disodium nitrilotriacetate
Trisodium nitrilotriacetate

Solid | White | Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat

SOLID
Irritating to skin and eyes

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if [illegible] waters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Disodium nitrilotriacetate, NTA Triglycine, Trisodium nitrilotriacetate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_6H_9O_6N$ Acid; $C_6H_7O_6NNa_2$; $C_6H_6O_6N_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, rubber gloves, chemical safety goggles

5 2 **Symptoms Following Exposure:** Toxicity and health hazard of these compounds are low. Contact with eyes causes irritation

5 3 **Treatment for Exposure:** EYES: flush with plenty of water, treat as mild alkaline irritation with boric acid solution, if eyes are irritated, get medical attention. SKIN: flush with plenty of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, LD50: 5 g/kg Disodium Grade 2, LD50: 2 g/kg rats Trisodium Grade 2, LD50: 4 g/kg rats

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 340 ppm 24 hr. guppy lethal conc. fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 0% 5 days

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

W. R. Grace and Co.
Hampshire Chemical Div.
Poisson Avenue
Nashua, N. H. 03061

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial 99 + % a water solution of trisodium salt containing 40% solids is also shipped

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

(Acid) H
(Salts) SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** Acid 191; Disodium 293; Trisodium 275

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** >1 at 20°C (solids)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5-NAA)

NOTES

NTA — 2-NITROANILINE

Common Synonyms	Solid	Orange	Musty odor
o-Nitroaniline 1-Amino-2-nitrobenzene o-Nitraniline Azoic Diazo Component 6	Sinks and mixes slowly with water		

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness or loss of consciousness

SOLID
Irritating to skin and eyes
If swallowed will cause headache, dizziness, nausea, vomiting or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning - poison - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1-Amino-2-nitrobenzene, Azoic Diazo Component 6, o-Nitraniline, o-Nitroaniline, ONA

3 2 **Coast Guard Compatibility Classification:** Not Listed

3 3 **Chemical Formula:** $1,2\text{-}C_6H_6N_2O_2$

3 4 **IMCO/United Nations Numerical Designation:** 6.1 1661

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Orange

4 3 **Odor:** Musty

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus, neoprene gauntlets, safety goggles, rubber or neoprene sealed tongue work shoes and apron, close weave cotton coveralls capable of closing at wrist and ankle

5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, nausea, methemoglobinemia, vomiting, weakness and stupor; cyanosis caused by contact usually develops in 4-6 hrs; prolonged and excessive exposures may also cause liver damage. Contact with eyes or skin causes irritation; continued exposure may cause same symptoms as inhalation or ingestion

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, administer [illegible] if required, get medical attention. INGESTION: induce vomiting, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. In case of solid, remove as much as possible, wash with soap and water. Be sure to remove solid from areas such as under fingernails or in hair.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade [illegible] 0.5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 970°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 24 ppm * daphnia threshold toxicity, fresh water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 American Aniline Products Inc
Mount Vernon St
Lock Haven, Pa 17745

2 Monsanto Company
800 North Lindbergh Blvd
St Louis, Mo 63166

3 Eastman Organic Chemicals
Rochester, N Y 14650

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 100%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not Listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 138.1

13 3 **Boiling Point at 1 atm:** 543°F = 284°C = 557°K

13 4 **Freezing Point:** 160°F = 71°C = 344 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.44 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** -10,089 Btu/lb = -5,550 cal/g = -232 × 10^3 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 4 and A)

NOTES

NAL

4-NITROANILINE

Common Synonyms
p-Nitroaniline
1-Amino-4-nitrobenzene
Azoic Diazo Component 37
Fast Red IG base
Fast Red GG base
PNA

Solid | Yellow | Mild Odor

Sinks in water

[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

[illegible]

Exposure

[illegible] FOR MEDICAL AID

DUST
POISONOUS IF INHALED
If inhaled will cause headache, coughing, difficult breathing, or loss of consciousness

[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause headache, coughing, or loss of consciousness

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1-Amino-4-nitrobenzene, Azoic Diazo Component 37, Fast Red IG base, Fast Red GG base, p-Nitraniline, p-Nitroaniline, PNA

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_6H_6N_2O_2$

3 4 **IMCO/United Nations Numerical Designation:** 6.1/1661

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** Faint ammonia, slightly pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bu Mines dust canister, rubber gloves, chemical safety goggle, face shield, rubber safety shoes

5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, drowsiness, shortness of breath, nausea, methemoglobinemia and unconsciousness, fingernails, lips and ears become bluish, prolonged and excessive exposures may also cause liver damage. Contact with eyes causes irritation and possible corneal damage. Contact with skin causes irritation, continued exposure may cause same symptoms as inhalation or ingestion

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, administer oxygen if required, get medical attention. INGESTION: induce vomiting, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water, be sure that no compound remains in the hair or under the fingernails

5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, LD$_{50}$ 0.5 - 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 329°F O.C. (molten solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:** Melts and burns

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 24 ppm *Daphnia threshold toxicity, fresh water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Monsanto Company
800 North Lindbergh Blvd
St. Louis, Mo. 63166

2 American Aniline Products Inc.
Mount Vernon St.
Lock Haven, Pa. 17745

3 Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 100%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 138.1

13 3 **Boiling Point at 1 atm:** 646°F = 336°C = 609°K

13 4 **Freezing Point:** 295°F = 146°C = 419°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.44 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** -9 920 Btu lb = -5 510 cal g = -231 × 10^3 J kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

NTB

NITROBENZENE

Common Synonyms
Nitrobenzol

Oily liquid Light yellow to brown Almond or shoe polish odor

Sinks in water Freezing point is 41° F

Fire

Combustible
POISONOUS VAPOR IS PRODUCED WHEN HEATED

Exposure

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-2

Issue warning - poison
Restrict access
Shields be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Essence of Mirbane
Nitrobenzol
Oil of Mirbane

3 2 **Coast Guard Compatibility Classification:** Nitrocompounds

3 3 **Chemical Formula:** $C_6H_5NO_2$

3 4 **IMCO United Nations Numerical Designation:** 6 1662

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Light green to yellow

4 3 **Odor:** Like shoe polish

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirator approved by U S Bureau of Mines for organic vapors, rubber gloves, splashproof goggles, coveralls, boots, safety shower and medical oxygen supply

5 2 **Symptoms Following Exposure:** If gets into skin, absorbed through skin; may be fatal if vapor or swallowed. First symptoms are blue skin, lips, fingernails and ears; headache, dizziness, drowsiness, headache, giddiness, weakness, nausea, vomiting and coma

5 3 **Treatment for Exposure:** Remove to fresh air and call physician at once. In case of skin exposure immediately flush skin with copious quantities of water for at least 15 minutes while removing contaminated clothing and shoes. Wash with soap and warm water with special attention to nails and hair. Administer oxygen and physician at once

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm

5 5 **Short-Term Inhalation Limits:** 10 ppm for 1 hour

5 6 **Toxicity by Ingestion:** Grade 3 Moderate poison

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating to eyes, but persons will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting on the skin and first degree burns on short exposure; may cause secondary burns on long exposure

5 10 **Odor Threshold:** 0.94 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 171°F (77°C) (closed cup)

6 2 **Flammable Limits in Air:** 1.8% - 11.5% by volume (11.5% may not be reliable)

6 3 **Fire Extinguishing Agents.** Water fog, foam, carbon dioxide or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 924°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 2.9 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 20 ppm 6 h minnow lethal fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 0.7% 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 American Cyanamid Co
Organic Chemicals Division
Bound Brook, N J 08805

2 E I duPont de Nemours & Co Inc
Explosives Dept
Wilmington, Del 19898

3 Ideal Chemical Corp
696 North State St
Jackson, Miss 39205

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99% (nitrobenzene)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

X X Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous liquid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
[illegible]	[illegible]
[illegible]	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammables (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 123.11

13 3 **Boiling Point at 1 atm:** 411.6°F = 210.9°C = 484.1°K

13 4 **Freezing Point:** 41.2°F = 5.1°C = 278.1°K

13 5 **Critical Temperature:** 719°F = 443°C = 720°K

13 6 **Critical Pressure:** 588 psia = 4.762 atm = 4.824 MN/m²

13 7 **Specific Gravity:** 1.204 at 20°C (water)

13 8 **Liquid Surface Tension:** 43.9 dynes/cm = 0.0439 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** 25 dynes/cm = 0.025 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** 160 Btu/lb = 89 cal/g = 3.7 × 10⁵ J/kg

13 13 **Heat of Combustion:** −10,420 Btu/lb = −5,790 cal/g = −242.5 × 10⁵ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 3 of 3

NOTES

REVISED 1978

NTE

NITROETHANE

Common Synonyms	Liquid	Colorless	Fruity Odor
	May float or sink in water		

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $C_2H_5NO_2$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild fruity somewhat disagreeable odor(fingernail-like)

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Supplied air or self-contained respirator, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes moderate irritation of respiratory tract. Ingestion causes irritation of mouth and stomach. Contact with liquid causes irritation of eyes and mild irritation of skin.

5.3 **Treatment of Exposure:** INHALATION: in case of pulmonary symptoms, give bed rest and oxygen, obtain medical attention at once. INGESTION: give large amount of water. EYES or SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 700 mg/kg for mouse

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.

5.10 **Odor Threshold:** 1000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 109°F (OC), 95°F (CC)
6.2 **Flammable Limits in Air:** 3.4% - 11.4%
6.3 **Fire Extinguishing Agents:** Water, carbon dioxide, or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective on fire; foam is not effective
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** 778°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May attack some forms of plastics
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Commercial Solvents Corp
245 Park Avenue
New York, N.Y. 10017

2. Ashland Chemical
420 W. Saint Paul Ave
Milwaukee, Wis. 53233

3. Pfaltz and Bauer Inc.
375 Fairfield Ave
Stamford, Conn. 06902

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial 95-96%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

APQT1-V

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poison	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reactive	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
**Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 75.07
*13.3 **Boiling Point at 1 atm:** 237°F = 114°C = 387 K
13.4 **Freezing Point:** -130°F = -90°C = 183 K
13.5 **Critical Temperature:** Data not available
13.6 **Critical Pressure:** Data not available
13.7 **Specific Gravity:** 1.05 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 31 dynes/cm = 0.0213 lb/ft at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
*13.10 **Vapor (Gas) Specific Gravity:** 2.6
*13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.113 at 20°C
13.12 **Latent Heat of Vaporization:** 237 Btu/lb = 132 cal/g = 5.53 kJ/g
*13.13 **Heat of Combustion:** -11,720 Btu/lb = -6,511 cal/g = -272.6 kJ/g
13.14 **Heat of Decomposition:** Not pertinent
*13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(continued on page 2)

NOTES

NXX	# NITROGEN, LIQUEFIED

Common Synonyms	Liquefied gas	Colorless	Odorless
	Floats and boils on water		

Fire	Not flammable
Exposure	VAPOR Not harmful In high concentrations may cause dizziness, difficult breathing or loss of consciousness LIQUID Will cause frostbite
Water Pollution	Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

2 LABEL



3 CHEMICAL DESIGNATIONS

- 3.1 **Synonyms:** Liquid nitrogen
- 3.2 **Coast Guard Compatibility Classification:** Not applicable
- 3.3 **Chemical Formula:** N_2
- 3.4 **IMCO/United Nations Numerical Designation:** 1066

4 OBSERVABLE CHARACTERISTICS

- 4.1 **Physical State (as shipped):** Liquefied gas
- 4.2 **Color:** Colorless and odorless
- 4.3 **Odor:** None

5 HEALTH HAZARDS

- 5.1 **Personal Protective Equipment:** Safety glasses or face shield, insulated gloves, and cotton clothing without cuffs should be worn when transferring liquid. Self-contained breathing apparatus should be worn in confined areas.
- 5.2 **Symptoms Following Exposure:** Inhalation of a high concentration of this gas can cause rapid suffocation because of oxygen deficiency. Symptoms include dizziness, nausea, vomiting, and unconsciousness. Contact with liquid can cause cryogenic burns or frostbite.
- 5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If breathing has stopped, trained personnel should immediately begin artificial respiration. If heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR). EYES: Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention. SKIN: Flush affected areas with plenty of lukewarm water. If frostbite has occurred, immediately soak affected parts in lukewarm water (105°F to 115°F; 41°C to 46°C). Do not rub affected areas. Get medical attention.
- 5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not applicable
- 5.5 **Short-Term Inhalation Limits:** Not established
- 5.6 **Toxicity by Ingestion:** Not pertinent
- 5.7 **Late Toxicity:** None
- 5.8 **Vapor (Gas) Irritant Characteristics:** None
- 5.9 **Liquid or Solid Irritant Characteristics:** Frostbite
- 5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not pertinent. Nonflammable compressed gas
- 6.2 **Flammable Limits in Air:** Not pertinent
- 6.3 **Fire Extinguishing Agents:** Not pertinent
- 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
- 6.5 **Special Hazards of Combustion Products:** Not pertinent
- 6.6 **Behavior in Fire:** Container may explode when heated
- 6.7 **Ignition Temperature:** Not pertinent
- 6.8 **Electrical Hazard:** Not pertinent
- 6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Heat of water will vaporize liquid nitrogen
- 7.2 **Reactivity with Common Materials:** No reaction. Low temperature may cause brittleness in rubber and plastic
- 7.3 **Stability During Transport:** Stable
- 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7.5 **Polymerization:** Not pertinent
- 7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** None
- 8.2 **Waterfowl Toxicity:** None
- 8.3 **Biological Oxygen Demand (BOD):** None
- 8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Union Carbide Corporation
Linde Division
Materials & Systems
2 Airco Inc.
575 Mountain Ave.
Murray Hill, N.J. 07974
3 Liquid Carbonic Corporation
135 S. La Salle Street
Chicago, Illinois

10. SHIPPING INFORMATION

- *10.1 **Grades of Purity:** 99.998%
- *10.2 **Storage Temperature:** -320°F
- *10.3 **Inert Atmosphere:** No requirement
- *10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

Hazard Assessment Handbook, CG-446-2
2 C 0 0 0

12. HAZARD CLASSIFICATIONS

- *12.1 **Code of Federal Regulations:** Nonflammable Nonpoisonous gas
- *12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
- *12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- *13.1 **Physical State at 15°C and 1 atm:** Gas
- *13.2 **Molecular Weight:** 28.0
- *13.3 **Boiling Point at 1 atm:** -320.4°F = -195.8°C = 77.4°K
- *13.4 **Freezing Point:** -346°F = -210.0°C = 63.2°K
- *13.5 **Critical Temperature:** -232.6°F = -147.0°C = 126.2°K
- *13.6 **Critical Pressure:** 492 psia = 33.5 atm = 3.4 MN/m²
- *13.7 **Specific Gravity:** 0.807 at -320.4°F (-195.8°C) (liquid)
- 13.8 **Liquid Surface Tension:** 9.5 dynes/cm = 0.0095 N/m at -320.4°F (-195.8°C)
- *13.9 **Liquid-Water Interfacial Tension:** Not pertinent
- *13.10 **Vapor (Gas) Specific Gravity:** 0.967
- *13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.4
- *13.12 **Latent Heat of Vaporization:** 85.6 Btu/lb = 47.6 cal/g = 199 J/g
- *13.13 **Heat of Combustion:** Not pertinent
- *13.14 **Heat of Decomposition:** Not pertinent
- *13.15 **Heat of Solution:** Not pertinent
- *13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

NOX	# NITROGEN TETROXIDE

Common Synonyms
Nitrogen peroxide
Nitrogen dioxide
Red oxide of nitrogen
Oxides of nitrogen
Dinitrogen tetroxide

Liquefied compressed gas Red-brown Sharp unpleasant chemical odor

Sinks and reacts with water. Poisonous brown vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. Keep upwind.
Wear goggles, self-contained breathing apparatus and rubber protective clothing.
Stop flow of gas if possible.
Evacuate area of unprotected persons.
Notify local health and pollution control agencies.

Fire

Not flammable
May cause fire and explode on contact with combustibles
POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED
Wear goggles, self-contained breathing apparatus and rubber protective clothing.
Flood dust area with water.
Stop flow of gas if safe to do.
Dike and dilute runoffs with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes
Move victim to fresh air.
Perform artificial respiration if breathing has stopped. Give oxygen if breathing is difficult. Give CPR if heart action has stopped.

LIQUID
Will burn skin and eyes
POISONOUS IF SWALLOWED
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flood with plenty of water.
IF SWALLOWED, induce vomiting. DO NOT induce vomiting if victim is convulsing or unconscious. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention.
DO NOT INDUCE VOMITING

Water Pollution

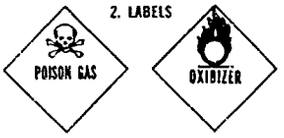
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of downstream water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-6)

Issue warning. Poison or contaminant. Water contaminant. Corrosive.
Restrict access.
Evacuate area.

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Dinitrogen tetroxide, Nitrogen peroxide, Nitrogen dioxide, Oxide of nitrogen, Red oxide of nitrogen
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula** N_2O_4
3.4 **IMCO/United Nations Numerical Designation** 2.1067

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Red-brown at ambient temperatures; colorless below about 14°F
4.3 **Odor** Pungent, acrid, suffocating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, safety goggles and face shield, protective clothing as dictated by water reactivity, respirator or self-contained breathing apparatus.
5.2 **Symptoms Following Exposure:** Very concentrated fumes produce coughing, choking, headache, nausea, pain in chest and abdomen; otherwise, few symptoms appear at time of exposure. After symptom-free period of 5–72 hours, pulmonary edema gradually develops, causing fatigue, restlessness, coughing, difficulty in breathing, frothy expectoration, mental confusion, lethargy, bluish skin and weak, rapid pulse. Since NOX interferes with gas exchange in lungs, unconsciousness and death by asphyxiation can result, usually within a few hours after onset of pulmonary edema.
5.3 **Treatment for Exposure.** INHALATION: remove patient to fresh air and have him breathe as deeply as possible; call a physician; enforce complete rest for 24–48 hours. Keep warm, give oxygen if coughing or tightness develops. A physician may administer morphine (10 mg.). EYES AND SKIN: flush with water for at least 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 5 ppm
5.5 **Short-Term Inhalation Limits** 25 ppm for 5 min
5.6 **Toxicity by Ingestion.** Data not available
5.7 **Late Toxicity.** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Vapors cause severe irritation of eyes and throat, and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second- and third-degree burns on short contact, and severe injuries to the eyes.
5.10 **Odor Threshold:** 5 ppm

6. FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air.** Not flammable
6.3 **Fire Extinguishing Agents** Stop flow of gas
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Produces toxic gas when heated
6.6 **Behavior in Fire:** Does not burn, but supports combustion of combustible materials such as wood. May cause fire or explode on contact with other materials.
6.7 **Ignition Temperature.** Not flammable
6.8 **Electrical Hazard** Data not available
6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves to form nitric acid and nitric oxide. Nitric oxide reacts with air to form more nitrogen tetroxide.
7.2 **Reactivity with Common Materials** Very corrosive to metals when wet. Reacts vigorously with combustible materials such as wood.
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Flush with water, then use soda ash or lime.
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
72 ppm/96 hr mosquito fish TL$_m$ fresh water
330–1,000 ppm/48 hr cockle TL$_m$ salt water
8.2 **Waterfowl Toxicity.** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Hercules Inc.
Explosives and Chemical Propulsion Dept.
Hercules Cu 1 94547

10. SHIPPING INFORMATION

10.1 **Grades of Purity:**
10.2 **Storage Temperature.** Ambient. Storage and transfer structures shall be equipped with mechanical ventilation systems.
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Pressure relief valves on containers

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A1J2O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Poisonous gas or liquid, Class A
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	2
Self Reactivity	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid or gas
13.2 **Molecular Weight:** 92.02
13.3 **Boiling Point at 1 atm:** 70.0°F = 21.2°C = 294 K
13.4 **Freezing Point** 11.9°F = −11.2°C = 262°K
13.5 **Critical Temperature:** 317.0°F = 158.2°C = 431.4°K
13.6 **Critical Pressure.** 1470 psia = 100 atm = 10.1 MN/m
13.7 **Specific Gravity.** 1.45 at 20°C (liquid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.2
13.11 **Ratio of Specific Heats of Vapor (Gas),** (est.) 1.162
13.12 **Latent Heat of Vaporization** 178 Btu/lb = 99.1 cal/g = 4.15 × 10^5 J/kg
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization** Not pertinent

(Continued on pages 4 and 5)

NOTES

REVISED 1978

NMT NITROMETHANE

Common Synonyms
Nitrocarbol

Watery liquid | Colorless | Strong odor

Sinks and mixes slowly with water. Irritating vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.

LIQUID
No appreciable harm to skin or eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Dispose and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nitrocarbol
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** CH_3NO_2
3.4 **IMCO/United Nations Numerical Designation:** 3.3 1261

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Fairly strong characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air mask (do NOT use organic canister); goggles
5.2 **Symptoms Following Exposure:** Liquid may dry out skin and cause irritation
5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; LD$_{50}$ 0.5–5.0 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.
5.10 **Odor Threshold:** Less than 200 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** 110°F (O.C.), 95°F (C.C.)
6.2 **Flammable Limits in Air:** 7.3% (U.E.L.)
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire:** Containers may explode
6.7 **Ignition Temperature.** 785°F
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** 1.1 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Wet material corrodes steel and copper; dry the reaction is slow
7.3 **Stability During Transport.** Considered stable, but may become sensitized by organic bases (amines) and some metal oxides such as lead pigments
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available
8.2 **Waterfowl Toxicity.** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Commercial Solvents Corp.
245 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 95-99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P Q R S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	3

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 61.04
13.3 **Boiling Point at 1 atm:** 214.25°F = 101.2°C = 374.4°K
13.4 **Freezing Point:** -20.1°F = -29°C = 244°K
13.5 **Critical Temperature:** 560°F = 315°C = 588°K
13.6 **Critical Pressure:** 915 psia = 62.3 atm = 6.31 MN/m²
13.7 **Specific Gravity:** 1.14 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 37.3 dynes/cm = 0.0370 N/m at 25°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.129
13.12 **Latent Heat of Vaporization:** 241 Btu/lb = 134 cal/g = 5.61 × 10⁵ J/kg
13.13 **Heat of Combustion:** -4541 Btu/lb = -2817 cal/g = -10.8 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 × 10⁶ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on back of card)

NOTES

REVISED 1978

NTP

2-NITROPHENOL

Common Synonyms
o-Nitrophenol
2-Hydroxynitrobenzene
ONP

Solid Yellow

Sinks and mixes slowly with water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause headache or loss of consciousness

SOLID
Irritating to skin and eyes
If swallowed will cause headache, nausea, or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Toxic warning: water contaminant
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2-Hydroxynitrobenzene; o-Nitrophenol; ONP

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_6H_5NO_3$

3 4 **IMCO/United Nations Numerical Designation:** 6.1/1663

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** Peculiar aromatic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus; rubber gloves; goggles

5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, drowsiness, nausea and blue color in lips, ears and fingernails (cyanosis). Contact with eyes causes irritation. Can be absorbed through the intact skin to give same symptoms as for inhalation.

5 3 **Treatment for Exposure.** INHALATION or INGESTION: remove victim to fresh air; give artificial respiration; call doctor if symptoms persist. EYES: flush with water for at least 15 min.; get medical attention. SKIN: cleanse thoroughly with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1,297 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic and irritating fumes of unburned material and oxides of nitrogen can form in fire

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.**
46.3 ml/gpm/96 hr/bluegill/TL$_m$/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
4.2 lbs/lb/0.94 days/acclimated culture

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Monsanto Company
800 North Lindbergh Blvd
St. Louis, MO 63166

2 J. T. Baker Chemical Co
Phillipsburg, NJ 08865

3 Eastman Organic Chemicals
Rochester, NY 14650

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 139.1

13 3 **Boiling Point at 1 atm.**
417°F = 214°C = 487°K

13 4 **Freezing Point.**
111°F = 44°C = 317°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.49 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −8,910 Btu/lb = −4,950 cal/g = −20.7 × 10^3 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

NPH	# 4-NITROPHENOL

Common Synonyms
p-Nitrophenol
4-Hydroxynitrobenzene
PNP

Solid Yellow to [illegible] Sweet odor

Sinks and mixes with water

[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause headache or loss of consciousness
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause headache, nausea or loss of consciousness
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 4-Hydroxynitrobenzene
p-Nitrophenol PNP

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $C_6H_5NO_3$

3 4 **IMCO/United Nations Numerical Designation:** 6.1 1663

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow to brown

4 3 **Odor:** Slight characteristic sweet

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Butyl rubber gloves, side shield safety glasses, dust mask or self contained breathing apparatus

5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, drowsiness, nausea and blue color in lips, ears and fingernails (cyanosis). Contact with eyes or skin causes irritation and can be absorbed through skin to give same symptoms as for inhalation

5 3 **Treatment for Exposure:** INHALATION or INGESTION: remove victim to fresh air, give artificial respiration, call a doctor if symptoms persist. EYES: flush with water for at least 15 min, get medical attention. SKIN: flush with water and wash well with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 LD$_{50}$ 500 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.**

6 5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen and fumes of unburned material may form in fires

6 6 **Behavior in Fire:** Decomposes violently at 279°C and will burn even in absence of air

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 E I du Pont de Nemours & Co Inc
Wilmington Del 19898

2 Monsanto Company
800 North Lindbergh Blvd
St Louis Mo 63166

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

HSS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 139.1

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point.** 235°F = 113°C = 386°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.48 at 20 °C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** −8,370 Btu/lb = −4,930 cal/g = −206 × 10^5 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

NPP

2-NITROPROPANE

Common Synonyms
Isonitropropane
2NP
sec-Nitropropane

Liquid | Colorless | Mild, fruity odor

May float or sink in water

[illegible]

Fire

Combustible
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]
Water may be ineffective on fire
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness, coughing, or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to Shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Isonitropropane
sec-Nitropropane 2-NP
3 2 **Coast Guard Compatibility Classification.** Nitrocompound
3 3 **Chemical Formula** $CH_3CHNO_2CH_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Mild fruity

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure** Inhalation causes respiratory tract irritation headache dizziness nausea and diarrhea Ingestion causes irritation of mouth and stomach Contact with liquid irritates eyes and causes mild irritation of skin
5 3 **Treatment for Exposure** INHALATION in case of pulmonary symptoms enforce bed rest and give oxygen get medical attention at once INGESTION give water, induce vomiting EYES or SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 25 ppm
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Grade 2 oral rat LD_{50} [illegible] mg/kg
5 7 **Late Toxicity** Causes liver cancer in rats
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of skin
5 10 **Odor Threshold** 300 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 100°F OC 82°F CC
6 2 **Flammable Limits in Air** 2 6% (UEL)
6 3 **Fire Extinguishing Agents.** Foam dry chemical carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Alcohol foam water may be ineffective
6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** 692°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Commercial Solvents Corp
245 Park Avenue
New York N Y 10017
2 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233
3 Eastman Organic Chemicals
Rochester N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity** Technical 94+%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q T U-X Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	4

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	3

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight** 89 09
13 3 **Boiling Point at 1 atm** 248 5°F = 120 3°C = 393 5°K
13 4 **Freezing Point** −132°F = −91°C = 182°K
13 5 **Critical Temperature** Data not available
13 5 **Critical Pressure** Data not available
13 7 **Specific Gravity:** 0 99 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 30 dynes cm = 0 030 N m at 20°C
13 9 **Liquid-Water Interfacial Tension** Data not available
13 10 **Vapor (Gas) Specific Gravity:** 3 06 at 16°C
13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 090 at 20°C
13 12 **Latent Heat of Vaporization.** 178 Btu lb = 99 cal g = 4 1 × 10⁵ J kg
13 13 **Heat of Combustion** −9 850 Btu lb = −5 460 cal g = −224 × 10⁵ J kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

NTC

NITROSYL CHLORIDE

Common Synonyms	Liquefied compressed gas Orange red Choking odor Liquid sinks and reacts with water. Poisonous visible vapor cloud is produced

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes

Water Pollution

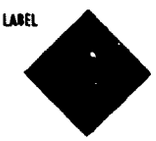
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** NOCl
3 4 **IMCO/United Nations Numerical Designation.** 2 0 1089

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied gas
4 2 **Color:** Yellow to red
4 3 **Odor:** Irritating, choking

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus (approved mask may be used for short exposures only); rubberized clothing; gloves; shoes; chemical goggles
5 2 **Symptoms Following Exposure:** Gas is highly toxic. Inhalation causes severe irritation of respiratory tract and damage to mucous membranes. Delayed effects, which include severe pulmonary edema, may not be apparent for several hours.
5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; call a doctor; enforce complete rest; artificial respiration if necessary; oxygen if available; keep at least 24 hours because of delayed effects. SKIN OR EYES: Flush with water for at least 15 min.; consult physician.
5 4 **Toxicity by Inhalation (Threshold Limit Value)** [Upper recommended]
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5 9 **Liquid or Solid Irritant Characteristics.** Severe burns to eyes and skin.
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Very toxic gases are generated when heated
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Dissolves and reacts to form acid solution and toxic oxides of nitrogen
7 2 **Reactivity with Common Materials.** Corrosive to most metals but reaction is not hazardous
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water. Residual acid may be neutralized with soda ash.
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Air Products and Chemicals Inc.
Specialty Gas Dept.
723 West Broad St.
Emmaus, Pa. 18049

2 Hercules Inc.
Explosives & Chemical Propulsion Dept.
Hercules Calif. 94547

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 97%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT

(See Hazard Assessment Handbook 446 3)

ACCO

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Nonflammable compressed gas
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas
13 2 **Molecular Weight:** 65.46
13 3 **Boiling Point at 1 atm:** 21.6°F = −5.5°C = 267.4 K
13 4 **Freezing Point:** −74°F = −59°C = 214°K
13 5 **Critical Temperature:** 334°F = 168°C = 441 K
13 6 **Critical Pressure:** 1300 psia = 90 atm = 9.1 MN/m
13 7 **Specific Gravity:** 1.36 at −5.5°C (liquid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 2.3
13 11 **Ratio of Specific Heats of Vapor (Gas).** 1.229
13 12 **Latent Heat of Vaporization.** 168 Btu/lb = 92.0 cal/g = 3.85 × 10⁵ J/kg
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

NTO

NITROUS OXIDE

Common Synonyms

Laughing gas
Dinitrogen monoxide

Liquefied compressed gas Colorless Odorless or mild sweet odor

Sinks and boils in water. Visible vapor cloud is produced

Fire

Not flammable but will intensify fires

Exposure

VAPOR

If inhaled will cause dizziness, difficult breathing or loss of consciousness.

LIQUID

Will cause frostbite

Water Pollution

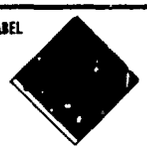
Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-1)

Restrict access

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dinitrogen monoxide
Laughing gas

3 2 **Coast Guard Compatibility Classification**
Not applicable

3 3 **Chemical Formula:** N_2O

3 4 **IMCO/United Nations Numerical Designation:** 2 1070

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquefied compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** None, slightly sweetish

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Self contained breathing apparatus for high vapor concentrations

5 2 **Symptoms Following Exposure.** Inhalation causes intense analgesia, concentrations of over 40 - 80% cause loss of consciousness preceded by hysteria. Contact of liquid with eyes or skin causes frostbite burn

5 3 **Treatment for Exposure:** INHALATION remove to fresh air. EYES get medical attention for frostbite burn. SKIN treat frostbite burn, soak in lukewarm water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** 50,000 ppm for 10 min

5 6 **Toxicity by Ingestion:** Grade 0 LD$_{50}$ > 15 g/kg

5 7 **Late Toxicity:** Causes birth defects in rats, can cause lethal effects in chick eggs

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard, product calls harmless to the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (nonflammable compressed gas)

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Will support combustion and may increase intensity of fire. Containers may explode when heated

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Supports combustion but does not cause spontaneous ignition

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Matheson Gas Products
P O Box 85
East Rutherford N J 07073

2. Airco Incorporated
Ohio Medical Products Division
9950 Airco Drive
Madison Wis 53701

3. Air Products and Chemicals Inc
Specialty Gas Department
P O Box 538
Allentown Pa 18105

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98.0+

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

ACUJ

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Nonflammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	
Water Pollution	
Human Toxicants	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight** 44.0

13 3 **Boiling Point at 1 atm**
−129.1 F = −89.5 C = 183.7 K

13 4 **Freezing Point:**
−134.5 F = −90.8 C = 182.4 K

13 5 **Critical Temperature**
97.7°F = 36.5 C = 309.7 K

13 6 **Critical Pressure:**
1,054 psia = 71.7 atm = 7.26 MN/m

13 7 **Specific Gravity:** 1.266 at −89°C (liquid)

13 8 **Liquid Surface Tension.**
16 Dynes/cm = 0.0016 N/m at −25 C

13 9 **Liquid-Water Interfacial Tension.**
Data not available

13 10 **Vapor (Gas) Specific Gravity:** 1.53

13 11 **Ratio of Specific Heats of Vapor (Gas)**
1.303 at 25°C

13 12 **Latent Heat of Vaporization** 169.5 Btu/lb
= 93.9 cal/g = 3.77 × 10^5 J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 3 and 4

NOTES

NAN	NONANE

Common Synonyms			
n-Nonane	Liquid	Colorless	Gasoline-like odor
	Floats on water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Personnel Protection Handbook CG 446-4)

Method of containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** n-Nonane

3 2 **Coast Guard Compatibility Classification** Paraffin

3 3 **Chemical Formula** C_9H_{20}

3 4 **IMCO/United Nations Numerical Designation** UN 1920

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color** Colorless

4 3 **Odor** Like gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Self-contained breathing apparatus for high vapor concentrations; goggles or face shield; rubber gloves

5 2 **Symptoms Following Exposure** Inhalation of concentrated vapor causes depression, irritation of respiratory tract and pulmonary edema. Liquid can irritate eyes and on prolonged contact skin. Ingestion causes irritation of mouth and stomach. Aspiration causes severe lung irritation, rapidly developing pulmonary edema and central nervous system involvement followed by depression

5 3 **Treatment for Exposure** INHALATION: remove victim from exposure, give artificial respiration if needed. EYES: irrigate with large amounts of water for 15 min. SKIN: flush with water, wash with soap; and water. INGESTION: do NOT induce vomiting, call physician. ASPIRATION: enforce bed rest, give oxygen, get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Grade 0 LD$_{50}$ > 15 g/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapors are moderately irritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics** No appreciable hazard. Practically harmless to the skin

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 88°F C.C.

6 2 **Flammable Limits in Air** 0.85% - 2.9%

6 3 **Fire Extinguishing Agents** Dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** 401°F

6 8 **Electrical Hazard** Class I, Group D

6 9 **Burning Rate** 3.5 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** [illegible] day

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Philips Petroleum Company
Chemical Department
Special Products Division
Bartlesville, OK 74004

2. The Humphreys Chemical Corporation
Devine Street
North Haven, Conn. 06473

3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity** Research, Pure, Technical all 99.5+

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NTI

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not Listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight** 128.3

13 3 **Boiling Point at 1 atm** 304°F = 151°C = 424 K

13 4 **Freezing Point** -64.3°F = -53.5°C = 219.7 K

13 5 **Critical Temperature** 610.5°F = 321.4°C = 594.6 K

13 6 **Critical Pressure** 335 psia = 22 Satm = 2.31 MN/m²

13 7 **Specific Gravity** 0.718 at 20°C (liquid)

13 8 **Liquid Surface Tension** 22.9 dynes/cm = 0.0229 N/m = 1.20 [illegible]

13 9 **Liquid-Water Interfacial Tension** [illegible] dynes/cm = 0.048 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity** 4.4

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.042 at 16°C

13 12 **Latent Heat of Vaporization** 127 Btu/lb = 70 cal/g = 2.93 × 10⁵ J/kg

13 13 **Heat of Combustion** -19,167 Btu/lb = -10,593 cal/g = -443.2 × 10⁵ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

NNN — NONANOL

Common Synonyms
1-Nonanol
Nonyl alcohol
Octylcarbinol

Liquid | Colorless | Rose or fruity odor

Floats on water. Freezing point is 23°F.

Fire

Combustible

Exposure

LIQUID
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4.

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
1-Nonanol — Octylcarbinol
Nonyl alcohol — Pelargonic alcohol

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula.** $CH_3(CH_2)_7CH_2OH$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Rose or fruity

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Goggles or face shield; rubber gloves

5.2 **Symptoms Following Exposure:** Liquid irritates eyes

5.3 **Treatment for Exposure:** Flush eyes and skin with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 on rat acute scale

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor irritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics.** Not expected to be a hazard. Practically harmless to the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 210°F (C.C.) 165°F (C.C.)

6.2 **Flammable Limits in Air:** 0.8% – 6.1%

6.3 **Fire Extinguishing Agents.** Alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 1 lb/lb in 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Geraudan Corp.
Aroma Chemical Division
125 Delawanna Ave.
Clifton, N.J. 07014

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 95%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3.

A-T-U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **KFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight.** 144.25

13.3 **Boiling Point at 1 atm**
415.1°F = 213°C = 486°K

13.4 **Freezing Point:** 23°F = -5°C = 268°K

13.5 **Critical Temperature:**
750°F = 399°C = 672°K

13.6 **Critical Pressure:**
350 psia = 24 atm = 2.4 MN/m²

13.7 **Specific Gravity:** 0.827 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 28 dynes/cm = 0.028 N/m at 24°C

13.9 **Liquid-Water Interfacial Tension:**
9.0 dynes/cm = 0.0090 N/m at 21.3°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.03

13.12 **Latent Heat of Vaporization**
72 Btu/lb = 39.9 cal/g = 1.67 × 10⁵ J/kg

13.13 **Heat of Combustion:** -17,800 Btu/lb = -9360 cal/g = -413 × 10³ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Liquid and Vapor Density

NOTES

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NON	NONENE

Common Synonyms
Propylene trimer
Nonene (non linear)

Liquid | Colorless | Gasoline-like odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or loss of consciousness.

LIQUID
Irritating to skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nonene (non linear)
Propylene trimer
Tripropylene

3.2 **Coast Guard Compatibility Classification:** Olefin

3.3 **Chemical Formula:** C_9H_{18}

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic, like gasoline

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator (gas + vapor canister or air supplied mask). Use splash shield.

5.2 **Symptoms Following Exposure:** High vapor concentrations irritate eyes and respiratory tract and act as an anesthetic.

5.3 **Treatment for Exposure:** INHALATION: remove patient to fresh air; if not breathing, stop apply artificial respiration and administer oxygen if available; do NOT use mouth-to-mouth method if victim ingested or inhaled the substance. INGESTION: DO NOT induce vomiting because aspiration hazard.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes slight smarting of eyes, nose and respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If pooled on clothing and allowed to remain, may cause smarting and reddening of skin.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 75°F (C.C.)

6.2 **Flammable Limits in Air:** 0.7% - 7% (by volume)

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide or dry chemical.

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.

6.5 **Special Hazards of Combustion Products:** Not pertinent.

6.6 **Behavior in Fire:** Not pertinent.

6.7 **Ignition Temperature:** Data not available.

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** 6.0 mm/min.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Atlantic Richfield Co.
ARCO Chemical Co. Division
260 S. Broad St.
Philadelphia, Pa. 19101

Exxon Chemical Co.
Houston, Tex. 77001

Sun Oil Co.
Marcus Hook, Pa. 19061

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame at all times or pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A.S.1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	
Water	0
Self Reactive	1

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 126.2

13.3 **Boiling Point at 1 atm:** 275 - 284°F = 135 - 140°C = 408 - 413°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Data not available

13.6 **Critical Pressure:** Data not available

13.7 **Specific Gravity:** 0.730 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
22 dynes/cm = 0.022 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
35.5 dynes/cm = 0.0355 N/m at 21.3°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.1044

13.12 **Latent Heat of Vaporization:**
126.2 Btu/lb = 69.4 cal/g
= 2.9 × 10⁵ J/kg

13.13 **Heat of Combustion:** -19,100 Btu/lb
= -10,600 cal/g = -445 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on next sheet)

NOTES

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NNE	1-NONENE

Common Synonyms
1-Nonylene
n-Heptylethylene

Liquid | Colorless | Gasoline-like odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness.

LIQUID
Irritating to skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment.
Shoreline cleanup.
Chemical and physical treatment.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Heptylethylene; n-Nonylene

3.2 **Coast Guard Compatibility Classification:** Oleic

3.3 **Chemical Formula:** $CH_3(CH_2)_6CH{=}CH_2$

3.4 **IMCO United Nations Numerical Designation:** Not assigned

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Hydrocarbon odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respiratory protection: self-contained breathing apparatus and full protective clothing.

5.2 **Symptoms Following Exposure:** Headache, dizziness, nausea, loss of consciousness and anesthesia.

5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air. Keep victim warm and quiet. Get medical attention. If breathing has stopped, give artificial respiration. If heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR). DO NOT INDUCE VOMITING. INGESTION: Call a physician immediately. Induce vomiting as directed by medical personnel. Never give anything by mouth to an unconscious person. If swallowed, do not induce vomiting because aspiration hazard.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor can cause irritation to eyes, nose, throat and respiratory system. Repeated exposure may cause bronchitis.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Liquid may cause mild irritation to skin. Prolonged exposure may cause reddening and blistering of skin.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** Data not available

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents.** Foam, carbon dioxide or dry chemical.

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.

6.5 **Special Hazards of Combustion Products:** Not pertinent.

6.6 **Behavior in Fire:** Not pertinent.

6.7 **Ignition Temperature:** Data not available.

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** Data not available.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.

7.2 **Reactivity with Common Materials:** No reaction.

7.3 **Stability During Transport:** Stable.

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization.** Not pertinent.

7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD)**
Data not available.

8.4 **Food Chain Concentration Potential:**
None.

9 SELECTED MANUFACTURERS

The Humphrey Chemical Co.
Devine St.
North Haven, Conn. 06473

2. Phillips Petroleum Co.
Bartlesville, Okla. 74004

3. Exxon Chemical Co.
Houston, Tex. 77001

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG-446-3)

NFI

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	
Health	
Vapor	
Liquid or Solid	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	
Water	
Self-Reactive	

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 126.2

13.3 **Boiling Point at 1 atm.**
302°F = 150°C = 423°K

13.4 **Freezing Point.**
-94°F = -70°C = 203°K

13.5 **Critical Temperature:**
422°F = 327°C = 600°K

13.6 **Critical Pressure**
465 psia = 32 atm = 3.24 MN/m²

13.7 **Specific Gravity:** 0.73 at 20°C/4°C

13.8 **Liquid Surface Tension:**
23.0 dynes/cm = 0.0230 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
Data not available

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio: Specific Heats of Vapor (Gas)**
Data not available

13.12 **Latent Heat of Vaporization**
124 Btu/lb = 69.0 cal/g = 2.89 x 10⁵ J/kg

13.13 **Heat of Combustion:** -19,450 Btu/lb = -10,800 cal/g = -452 x 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Data not available

NOTES

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NNP	NONYLPHENOL

Common Synonyms	Thick liquid Light yellow straw color Medicinal odor Floats on water
Fire	Combustible
Exposure	Liquid Will burn skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical coagulation

2. LABELS

No label is required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification:** Group 1

3 3 **Chemical Formula:** $C_{15}H_{24}O$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Pale straw

4 3 **Odor:** Phenolic medicinal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber or impervious protective clothing

5 2 **Symptoms Following Exposure:** Material is irritating to skin and eyes

5 3 **Treatment for Exposure:** EYES Flush with water for 15 minutes. SKIN Wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapor is irritating to eyes, mucous membranes and skin. Direct contact with liquid may cause severe burns.

5 9 **Liquid or Solid Irritant Characteristics:** Liquid is irritating to eyes and skin. Prolonged or repeated skin contact may cause dermatitis.

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 141°F CC 250°F OC

6 2 **Flammable Limits in Air.** Upper 1.1% Lower 0.9%

6 3 **Fire Extinguishing Agents.** Water spray, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective on fire

6 5 **Special Hazards of Combustion Products.** None known

6 6 **Behavior in Fire:** Not reported

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not reported

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** No data present

7 5 **Polymerization:** Not reported

7 6 **Inhibitor of Polymerization:** Not reported

8. WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

GAF Corp
Chemical Division
Calvert City, Ky 42029

Jefferson Chemical Co., Inc.
Post Office Box 1130
Houston, Tex 77002

Rohm & Haas
Independence Mall West
Philadelphia, Pa 19105

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Mixed para isomers predominantly meta and 2,4 dimorphenol

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame or vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

N 1 1

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	2
Poisons	
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Organic Chemicals	2
Water	0
Self Reactive	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight** 220.34

13 3 **Boiling Point at 1 atm.** 293°C at 760 mm Hg

13 4 **Freezing Point** Not reported

13 5 **Critical Temperature** 427°C at 28.5 atm abs

13 6 **Critical Pressure** Not reported

13 7 **Specific Gravity.** 0.9494 at 25°C (liquid)

13 8 **Liquid Surface Tension** Not reported

13 9 **Liquid-Water Interfacial Tension** Not reported

13 10 **Vapor (Gas) Specific Gravity** Not reported

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not reported

13 12 **Latent Heat of Vaporization.** Not reported

13 13 **Heat of Combustion** -17,500 Btu/lb -9,722 cal/g

13 14 **Heat of Decomposition** Not reported

13 15 **Heat of Solution** Not reported

13 16 **Heat of Polymerization** Not reported

NOTES

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OAN OCTANE

Common Synonyms
• Octane

Liquid Colorless Gasoline like odor

Floats on water. Flammable irritating vapor is produced.

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness, difficult breathing or loss of consciousness

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6.

Isolate hazard area, deny flammable
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1* Synonyms:
3.2 Coast Guard Compatibility Classification. Paraffin
3.3 Chemical Formula:
3.4 IMCO/United Nations Numerical Designation.

4 OBSERVABLE CHARACTERISTICS

4.1* Physical State (as shipped). Liquid
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1* Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits.
5.6 Toxicity by Ingestion
5.7* Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics.
5.9 Liquid or Solid Irritant Characteristics
5.10 Odor Threshold

6 FIRE HAZARDS

6.1* Flash Point:
6.2 Flammable Limits in Air.
6.3 Fire Extinguishing Agents
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products.
6.6 Behavior in Fire:
6.7* Ignition Temperature
6.8 Electrical Hazard
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1* Reactivity with Water
7.2 Reactivity with Common Materials.
7.3 Stability During Transport
7.4 Neutralizing Agents for Acids and Caustics.
7.5* Polymerization.
7.6 Inhibitor of Polymerization

8 WATER POLLUTION

8.1* Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1* Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3.

12 HAZARD CLASSIFICATIONS

12.1* Code of Federal Regulations.
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications.

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1* Physical State at 15°C and 1 atm.
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm.
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension.
13.9 Liquid-Water Interfacial Tension.
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion.
13.14 Heat of Decomposition
13.15 Heat of Solution
13.16 Heat of Polymerization

Continued on page 1 and 2

NOTES

OTA

OCTANOL

Common Synonyms
1-Octanol
Octyl alcohol
Heptylcarbinol

Thick liquid | Colorless | Sweet odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin
Will burn eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Irritating to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical Containment
Should not be flushed
Chemical Containment Not Practical

2 LABELS

Not Regulated (Non-Flammable)
Combustible Liquid

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Not Found
Heptylcarbinol
Octyl
Octyl alcohol

3.2 Coast Guard Compatibility Classification: Not Assigned

3.3 Chemical Formula: $CH_3(CH_2)_6CH_2OH$

3.4 IMCO United Nations Numerical Designation: Not Assigned

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid

4.2 Color: Colorless

4.3 Odor: Sweet odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Chemical goggles and face shield

5.2 Symptoms Following Exposure: Irritation of eyes

5.3 Treatment for Exposure: Flush eyes with water for 15 minutes

5.4 Toxicity by Inhalation (Threshold Limit Value): Data

5.5 Short-Term Inhalation Limits: Data

5.6 Toxicity by Ingestion: Grade 1, oral rat LD_{50} 3.2 g/kg

5.7 Late Toxicity: None

5.8 Vapor (Gas) Irritant Characteristics: Vapor irritating to eyes and respiratory system

5.9 Liquid or Solid Irritant Characteristics: Liquid irritating to eyes and skin

5.10 Odor Threshold: 0.49 ppm

6 FIRE HAZARDS

6.1 Flash Point: 178°F C.C.

6.2 Flammable Limits in Air: Data

6.3 Fire Extinguishing Agents: Foam
Use water to cool containers

6.4 Fire Extinguishing Agents Not to be Used: Not pertinent

6.5 Special Hazards of Combustion Products: Not pertinent

6.6 Behavior in Fire: Not reported

6.7 Ignition Temperature: Data

6.8 Electrical Hazard: Not reported

6.9 Burning Rate: Data

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: Not reported

7.2 Reactivity with Common Materials: Not reported

7.3 Stability During Transport: Not reported

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data

8.2 Waterfowl Toxicity: Data

8.3 Biological Oxygen Demand (BOD)
Data

8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Chemical Co
Chem Chemical Div
Plant Products
Solvent & Chem Co
Chemical
Industrial Chemicals Division
Research
Chemical Co
Products & Chemical
Chemical Co

10 SHIPPING INFORMATION

10.1 Grades of Purity: Technical grade

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: No requirement

10.4 Venting: Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, page 4-4

NFI

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
Combustible Liquid

12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed

12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid

13.2 Molecular Weight: 130

13.3 Boiling Point at 1 atm.
390.8°F = 199.3°C = 472.4°K

13.4 Freezing Point: 23°F = -5°C = 268°K

13.5 Critical Temperature:
Data

13.6 Critical Pressure:
Data

13.7 Specific Gravity: 0.827 at 20°C/4°C

13.8 Liquid Surface Tension:
Data

13.9 Liquid-Water Interfacial Tension:
Data

13.10 Vapor (Gas) Specific Gravity:
Data

13.11 Ratio of Specific Heats of Vapor (Gas)
Data

13.12 Latent Heat of Vaporization
Data

13.13 Heat of Combustion:
Data

13.14 Heat of Decomposition: None

13.15 Heat of Solution: None

13.16 Heat of Polymerization: None

NOTES

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OTE

1-OCTENE

Common Synonyms
Caprylene
alpha-Octylene

Liquid Colorless Gasoline-like odor

Floats on water Flammable, harmful vapor is produced

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
If inhaled, will cause dizziness

LIQUID
Irritating to skin and eyes
If swallowed, will cause nausea or vomiting

DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Caprylene
alpha-Octylene

3 2 **Coast Guard Compatibility Classification.** Olefin

3 3 **Chemical Formula:** $CH_3(CH_2)_5CH{=}CH_2$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor canister goggles or face shield

5 2 **Symptoms Following Exposure** Generally low toxicity Mildly anesthetic at high vapor concentrations May irritate eyes

5 3 **Treatment for Exposure** INHALATION remove from exposure support respiration INGESTION do NOT induce vomiting

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present at high concentrations The effects temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 70°F O C

6 2 **Flammable Limits in Air:** 0 9 % (LEL)

6 3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature.** 493°F

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** 6 8 mm min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 0 9% (theor) 1 1 day

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Air Products and Chemicals Inc
Houdry Division
Paulsboro N J 08066

2 The Humphrey Chemical Co
Devine St
North Haven Conn 06473

3 Phillips Petroleum Co
Bartlesville Okla 74004

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Research 99 7%
pure 99 3% technical 95%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A-T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 112 22

13 3 **Boiling Point at 1 atm:**
250 3°F = 121 3°C = 394 5°K

13 4 **Freezing Point:**
−151°F = −102°C = 172°K

13 5 **Critical Temperature**
560 1°F = 293 4°C = 566 6°K

13 6 **Critical Pressure:**
400 psia = 27 2 atm = 2 76 MN/m

13 7 **Specific Gravity:** 0 715 at 20°C (liquid)

13 8 **Liquid Surface Tension.**
21 76 dynes/cm = 0 02176 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension**
(est) 50 dynes/cm = 0 05 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 050

13 12 **Latent Heat of Vaporization**
129 Btu/lb = 71 9 cal/g = 3 01 × 10⁵ J/kg

13 13 **Heat of Combustion** −19 170 Btu/lb
= −10 650 cal/g = −445 89 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

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OET — OCTYL EPOXY TALLATE

Common Synonyms			
Epoxidized tall oil, octyl ester	Liquid	Pale yellow	Mild odor
	Floats on water		

Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with CO2, dry chemical, or foam.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing.
Flush eyes with water.
IF IN EYES: Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes.
IF SWALLOWED: Induce VOMITING.
IF VAPOR INHALED: Move victim to fresh air.
IF VAPOR INHALED or SWALLOWED and VICTIM UNCONSCIOUS OR CONVULSING: DO NOT induce vomiting. Keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Epoxidized tall oil octyl ester
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula.** Mixture
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow
4 3 **Odor:** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles, face shield, oil resistant gloves
5 2 **Symptoms Following Exposure:** Contact with eyes causes mild inflammation. Contact with skin may produce allergic response
5 3 **Treatment for Exposure:** EYES or SKIN: remove excess oil with cloth or absorbent paper, then wash with soapy water and flush with clear water; consult a physician
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 0, LD_{50} > 15 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 480°F O.C.
6 2 **Flammable Limits in Air.** Not pertinent
6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective
6 5 **Special Hazards of Combustion Products.**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature.** Data not available
6 8 **Electrical Hazard.** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

USS Chemicals
600 Grant St
Pittsburgh, Pa. 15230

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 420 (approx.)
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est.) 1.002 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 40.1 dynes/cm = 0.0401 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Data not available
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

OCF — OILS: CLARIFIED

Common Synonyms	Oily liquid Colorless Floats on water
Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Data not available
4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield
5 2 **Symptoms Following Exposure:** If liquid ingested an increased frequency of bowel movements will occur
5 3 **Treatment for Exposure:** INGESTION Do not induce vomiting SKIN Wipe off wash with soap and water EYES Wash with water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** No single TLV applicable
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 1 LD_{50} 5 to 15 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Shell Oil Co
One Shell Plaza
Houston Tex 77001
2 Exxon Co
Houston Tex 77002
3 Sun Oil Co
St Davids Pa 19087

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1 U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Data not available
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est.) 0.85 at 20°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** (est.) −18 000 Btu/lb = −10 000 cal/g = −420 × 10³ J/g
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5065

NOTES

REVISED 1978

OIL	OILS: CRUDE

Common Synonyms
Petroleum

Oily liquid Dark Acrid odor

Floats on water. Flammable vapor may be produced

Fire

Combustible

Exposure

VAPOR
Not irritating to eyes, nose or throat

LIQUID
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 445-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Petroleum
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO United Nations Numerical Designation.** 3 1 1267

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Dark
4 3 **Odor:** Offensive tarry

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles, face shield, rubber gloves and boots
5 2 **Symptoms Following Exposure:** May irritate eyes and skin
5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off and wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to the eyes and throat
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Dry chemical, carbon dioxide, foam
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.**
Upper * test water fish toxic. Fresh water 200 ppm/24 hr/50% kills/pimfish. 20 ml/l normal response in water
*Time period not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Dem. and (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Exxon Co
Houston, Tex. 77001
2 Shell Oil Co
Shell Plaza
Houston, Tex. 77002
3 Sun Oil Co
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Wide variety depending on oil field where produced
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A E L

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm.** Varies > 70°F (> 21°C) to > 650°F (> 343°C)
13 4 **Freezing Point.** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.75 - 0.95 at 15.5°C (liquid)
13 8 **Liquid Surface Tension.** 24 - 36 dynes/cm = 0.024 - 0.036 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not applicable (liquid) = Not pertinent × 10⁴ J/kg
13 13 **Heat of Combustion:** ~18,250 Btu/lb = ~42,434 × 10⁴ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on page 2)

NOTES

REVISED 1978

ODS

OILS: DIESEL

Common Synonyms
Fuel Oil 1-D
Fuel Oil 2-D

Oily liquid | Yellow-brown | Lube oil/fuel oil odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHAPSE

(See Response Methods Handbook, CG-446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Fuel Oil 1-D
Fuel Oil 2-D

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation:** 3.1 1270

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Light brown

4.3 **Odor:** Like fuel oil

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield

5.2 **Symptoms Following Exposure:** If liquid is ingested, an increased frequency of bowel movements will occur

5.3 **Treatment for Exposure:** INGESTION: do NOT induce vomiting. SKIN: wipe off, wash with soap and water. EYES: wash with copious amounts of water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** No single TLV applicable

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 1-D, 5 to 15 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause an slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** (1-D) 100°F (C.C.)
(2-D) 125°F (C.C.)

6.2 **Flammable Limits in Air:** 1.3 - 6.0 vol. %

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** (1-D) 380-625°F
(2-D) 490-545°F

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 204 mg/l/24 hr juvenile American shad/ TL_m salt water

8.2 **Waterfowl Toxicity:** >20 ml/kg /LD_{50}/mallards

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Co.
Houston, Tex. 77001
2. Shell Oil Co.
1 Shell Plaza
Houston, Tex. 77001
3. Sun Oil Co.
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Diesel Fuel 1-D (ASTM) Diesel Fuel 2-D (ASTM)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-1-1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight.** Not pertinent

13.3 **Boiling Point at 1 atm.** 350-640°F = 288-338°C = 561-612°K

Freezing Point: 0 to -90°F = -34°C = 239°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.841 at 16°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 32 dynes/cm = 0.032 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion:** -18,400 Btu/lb = -10,200 cal/g = 429 x 10^3 J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

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OCA — OILS, EDIBLE: CASTOR

Common Synonyms	Oils liquid; Light yellow to green; Weak odor Floats on water
Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Light yellow to green
4 3 **Odor:** Characteristic, odorless

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield
5 2 **Symptoms Following Exposure:** Ingested causes severe diarrhea
5 3 **Treatment for Exposure:** INGESTION: if more than 2 tablespoons, consult physician. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** None
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 1 Dose 15 g/kg (fatal dose unknown but presumably larger)
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** None
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 445°F C.C.
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 840°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. N L Industries Inc
Baker Castor Oil Co Division
20 Avenue A
Bayonne N J 07002
2. Textron Inc
Spencer Kellogg Division
Buffalo N Y 14240
3. Arthur C Trask Corp
7660 W 63rd St
Argo Ill 60501

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial meets Mil Spec and ASTM USP USP Odorless Refined meets NAVORD Spec Technical All grades differ only in color and acid values
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

ATU

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

12 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Varies, depending on composition
13 4 **Freezing Point:** 0°F = -2°C = 271 K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.9 at 25°C (liquid)
13 8 **Liquid Surface Tension:** 39 dynes/cm = 0.039 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** 19.2 dynes/cm = 0.0192 N/m at 22°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** -3443 kJ/g = -1.48 × 10⁷ J/kg-mol
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on next page)

NOTES

REVISED 1978

OCC

OILS, EDIBLE: COCONUT

Common Synonyms

Coconut butter
Copra oil
Coconut oil

Solid or liquid | Light yellow to orange | Weak odor

Floats on water

Fire

Combustible

Exposure

LIQUID OR SOLID
Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(Spill Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Coconut butter, Coconut oil, Copra oil
3 2 **Coast Guard Compatibility Classification:** Esters
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid or solid
4 2 **Color:** Light yellow-orange
4 3 **Odor:** Weak acid

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Oil is essentially nontoxic, but can cause mild irritation of eyes on contact
5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 420°F C.C. (crude) 580°F C.C. (refined)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing, water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 PVO International Inc
1145 South Tenth Street
Richmond, Calif 94804

2 Cargill Inc
Cargill Building
Minneapolis, Minn 55402

3 Capital City Products Co
P O Box 569
Columbus, Ohio 43216

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Crude, Cochin
All grades contain 5% free fatty acids
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** (Open flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T I

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid or liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Not pertinent (very high)
13 4 **Freezing Point:** (approx.) 76°F = 24°C = 297°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.922 at 25°C (liquid)
13 8 **Liquid Surface Tension:** 33.4 dynes/cm = 0.0334 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 25°C
*2 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** (est.) = -15,500 Btu/lb = -8,600 cal/g = -360 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

OCS

OILS, EDIBLE: COTTONSEED

Common Synonyms

Oily liquid | Pale yellow | Odorless

Floats on water. Freezing point is 32° F

Fire

Combustible

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow
4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield
5 2 **Symptoms Following Exposure:** None is used as a food
5 3 **Treatment for Exposure:** Wash with water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value):** None
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** None
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** None
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 486°F C.C. (refined oil), 610°F C.C. (cooking oil)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 650°F (refined oil)
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Diamond Shamrock Corp.
   Sugar Chemicals Division
   Morristown, N.J. 07960
2. Pacific Vegetable Oil Corp.
   World Trade Center
   San Francisco, Calif. 94111
3. Stokely Van Camp, Inc.
   Capital City Products Co.
   Columbus, Ohio 43221

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Refined cooking
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A T 1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Very high
13 4 **Freezing Point:** 32°F = 0°C = 273°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.922 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 35 dynes/cm = 0.035 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** [illegible]
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** [illegible]
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

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OFS	OILS, EDIBLE: FISH

Common Synonyms

Oily liquid Pale yellow Fishy odor

Floats on water

Fire

Combustible

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** List
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Pale yellow
4.3 **Odor:** Fishy

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield
5.2 **Symptoms Following Exposure:** None known
5.3 **Treatment for Exposure:** If in eyes, flush with water for at least 15 mins.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** None
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** None
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 420°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Ashland Oil, Inc.
Organic Product Division
Cedar Run Observatory
Diamond Shamrock Corp.
Natural Chemical Division
Morristown, N.J. 07960

Marine Products Co.
[illegible]
Boston, Mass. 02[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

NFI

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.91 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 38 dynes/cm = 0.038 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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OLD — OILS, EDIBLE: LARD

Common Synonyms			
Prime steam lard Kettle rendered lard Leaf lard Lard	Liquid or solid Floats on water	Colorless to Light yellow	Fatty odor

Fire	Combustible
Exposure	LIQUID OR SOLID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Kettle-rendered lard, Leaf lard, Prime steam lard
3.2 **Coast Guard Compatibility Classification:** Esters (1)
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Fatty

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Substance is essentially nontoxic. Prolonged contact with skin may cause dermatitis (red acne). Hot liquid can burn eyes or skin.
5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min, get medical attention if irritation persists. SKIN: wipe off, get medical attention for burn. INGESTION: do NOT induce vomiting.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] C.C.
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing, water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 833°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Swift Edible Oil Company
[illegible] West Jackson Boulevard
Chicago, IL 60604

2. Mavco Oil and Chemical Co., Inc.
Beaver and Cass Streets
Bristol, PA 19007

3. Colfax, Inc.
[illegible]
Paramount, CA 90723

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Various grades depending on source of animal tissue used and method of rendering
10.2 **Storage Temperature:** Ambient, or elevated (not required)
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

NFI

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** 90°F = 32°C = 305°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.861 at 15°C (solid)
13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 30°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 30°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** -9,540 Btu/lb = -9,120 cal/g = -380 x 10^3 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

001

OILS, EDIBLE: OLIVE

Common Synonyms

Oily liquid Pale yellow

Floats on water

Fire

Combustible

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life unknown
Fouling to shoreline
May be dangerous if enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-2

Mechanical containment
Manual recovery
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification:** Fatty

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Pale yellow green

4 3 **Odor:** Weak characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Compressed air mask

5 2 **Symptoms Following Exposure:** None reported

5 3 **Treatment for Exposure:** No treatment necessary

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not applicable

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** None

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** None

5 9 **Liquid or Solid Irritant Characteristics:** None

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 437°F C.C.

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical, water, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water stream may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 650°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** No pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Procter & Gamble Co.
4 Ivorydale Ave.
East Palestine, N. J. 07207

Procter & Gamble Co.
Cincinnati, Pa. 9423

Wesley Hammond Gulf Co. Inc.
Staten Island, N. Y. 10314

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

N T I

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*3 1 **Physical State at 15°C and 1 atm:** Liquid

*3 2 **Molecular Weight:** Not pertinent

*3 3 **Boiling Point at 1 atm:** Not applicable

*3 4 **Freezing Point:** Not pertinent

*3 5 **Critical Temperature:** Not pertinent

*3 6 **Critical Pressure:** Not pertinent

*3 7 **Specific Gravity:** 0.918 at 20°C (liquid)

*3 8 **Liquid Surface Tension:**
36 dynes/cm = 0.036 N/m at 20°C

*3 9 **Liquid-Water Interfacial Tension:** Not pertinent

*3 10 **Vapor (Gas) Specific Gravity:** Not pertinent

*3 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

*3 12 **Latent Heat of Vaporization:** Not pertinent

*3 13 **Heat of Combustion:** -17,000 Btu/lb = -9,400 cal/g

3 14 **Heat of Decomposition:** Not pertinent

*3 15 **Heat of Solution:** Not pertinent

*3 16 **Heat of Polymerization:** Not pertinent

(continued on page 1 and 2)

NOTES

REVISED 1978

OPM OILS, EDIBLE: PALM

Common Synonyms			
Palm fruit oil Palm butter Palm oil	Liquid or solid Floats on water	Orange red	Pleasant odor

Fire	Combustible
Exposure	LIQUID OR SOLID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Mechanical containment
Should be recovered
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Palm butter, Palm fruit oil
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Semi-solid to liquid
4.2 **Color:** Orange red
4.3 **Odor:** Pleasant characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Oil is essentially a vesicant, may cause mild irritation of eyes
5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing, water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Cape [illegible] Products
P.O. Box [illegible]
Columbus, OH [illegible]

Welch, Holme & Clark Co., Inc.
[illegible] South Front Street
Harrison, NJ 07029

PVO International, Inc.
[illegible] South Tenth Street
Richmond, CA [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Various grades depending on source. Contains [illegible] fatty acids
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

XYT

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	[illegible]
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid to liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Not pertinent (very high)
13.4 **Freezing Point:** 70–90°F = 21–32°C = 294–305°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.900 at 15°C (Natural)
13.8 **Liquid Surface Tension:** (water = 72 dynes/cm = 0.072 N/m at 25°C)
13.9 **Liquid-Water Interfacial Tension:** (water = 50 dynes/cm = 0.050 N/m at 25°C)
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** (-ΔH combustion) = [illegible] BTU/lb = -8,400 cal/g = -[illegible] kJ/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on next sheet)

NOTES

OPN	# OILS, EDIBLE: PEANUT

Common Synonyms	Oily liquid Pale yellow Weak peanut odor Floats on water
Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula.** Not applicable
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow
4 3 **Odor:** Characteristic slight nutty odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield
5 2 **Symptoms Following Exposure.** None is a food
5 3 **Treatment for Exposure** EYES flush with water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** None
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics** None
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 540°F O C (540°F C C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature.** 833°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Reilly Whiteman Inc
Conshohocken Pa 19428
2 Stokely-Van Camp, Inc
Capital City Products Co
Columbus Ohio 43216
3 Welch Holme and Clark Co Inc
1000 S 4th St
Harrison, N J 07029

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm** Very high
13 4 **Freezing Point:** 28°F = −2°C = 271 K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0 919 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 35.5 dynes/cm = 0 0355 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension.** 30 dynes/cm = 0 030 N/m at 70°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** (est.) −16 000 Btu/lb = −8 870 cal/g = −371 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

OSF OILS, EDIBLE: SAFFLOWER

Common Synonyms			
Safflower oil Safflower seed oil Carthamus tinctorius oil	Liquid	Light yellow	Bland fatty odor
	Floats on water		

Fire

Combustible

Exposure

LIQUID
Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** *Carthamus tinctorius* oil, Safflower seed oil
3 2 **Coast Guard Compatibility Classification** Ester
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow
4 3 **Odor:** Bland, fatty

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Oil is essentially nontoxic. Contact with eyes can cause mild irritation
5 3 **Treatment for Exposure.** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold.** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective; water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate.** 4 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 PVO International Inc
1148 South Tenth Street
Richmond, Calif. 94804

2 Capital City Products Co
P. O. Box 569
Columbus, Ohio 43216

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Food grade contains 0.02% propyl gallate, 0.01% citric acid or may contain no additives. Technical non break and alkali refined
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A-T-L

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm:** Not pertinent (very high)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity.** 0.923 at 25°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension.** (est.) 50 dynes/cm = 0.050 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** (est.) −15 500 Btu/lb = −8 600 cal/g = −360 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

OSB — OILS, EDIBLE: SOYA BEAN

Common Synonyms	Oils liquid Pale yellow Weak odor Floats on water
	[illegible]
Fire	Combustible Extinguish with dry chemical, foam, or carbon dioxide Water may cause frothing Keep containers cool with water
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

- 3 1 **Synonyms** Soybean oil
- 3 2 **Coast Guard Compatibility Classification.** Ester
- 3 3 **Chemical Formula:** Not applicable
- 3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

- 4 1 **Physical State (as shipped)** Liquid
- 4 2 **Color:** Pale yellow
- 4 3 **Odor:** Weak

5. HEALTH HAZARDS

- 5 1 **Personal Protective Equipment** Goggles or face shield
- 5 2 **Symptoms Following Exposure** None is a food
- 5 3 **Treatment for Exposure:** If in eyes flush with water for at least 15 min
- 5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
- 5 5 **Short-Term Inhalation Limits** Not pertinent
- 5 6 **Toxicity by Ingestion.** None
- 5 7 **Late Toxicity:** None
- 5 8 **Vapor (Gas) Irritant Characteristics.** None
- 5 9 **Liquid or Solid Irritant Characteristics.** None
- 5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

- 6 1 **Flash Point** 540°F C C
- 6 2 **Flammable Limits in Air:** Data not available
- 6 3 **Fire Extinguishing Agents.** Dry chemical foam, or carbon dioxide
- 6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing
- 6 5 **Special Hazards of Combustion Products.** Not pertinent
- 6 6 **Behavior in Fire** Not pertinent
- 6 7 **Ignition Temperature** 833°F
- 6 8 **Electrical Hazard:** Not pertinent
- 6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

- 7 1 **Reactivity with Water** No reaction
- 7 2 **Reactivity with Common Materials:** No reaction
- 7 3 **Stability During Transport** Stable
- 7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7 5 **Polymerization** Not pertinent
- 7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8 1 **Aquatic Toxicity** Data not available
- 8 2 **Waterfowl Toxicity** Data not available
- 8 3 **Biological Oxygen Demand (BOD).** 39%, 5 days
- 8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Ashland Oil Co
Chemical Products Division
Peoria Ill 61601

2 A E Staley Manufacturing Co
Decatur, Ill 62525

3 Arthur C Trask Corp
7666 W 63rd St
Argo Ill 60501

10 SHIPPING INFORMATION

- 10 1 **Grades or Purity:** Refined, crude
- 10 2 **Storage Temperature:** Ambient
- 10 3 **Inert Atmosphere** No requirement
- 10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U

12 HAZARD CLASSIFICATIONS

- 12 1 **Code of Federal Regulations:** Not listed
- 12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
- 12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13 1 **Physical State at 15°C and 1 atm:** Liquid
- 13 2 **Molecular Weight** Not pertinent
- 13 3 **Boiling Point at 1 atm.** Very high
- 13 4 **Freezing Point:** −4°F = −20°C = 253°K
- 13 5 **Critical Temperature** Not pertinent
- 13 6 **Critical Pressure** Not pertinent
- 13 7 **Specific Gravity** 0.922 at 20°C (liquid)
- 13 8 **Liquid Surface Tension** (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 13 9 **Liquid-Water Interfacial Tension** (est.) 50 dynes/cm = 0.05 N/m at 20°C
- 13 10 **Vapor (Gas) Specific Gravity** Not pertinent
- 13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
- 13 12 **Latent Heat of Vaporization:** Not pertinent
- 13 13 **Heat of Combustion** (est.) = −16,000 Btu/lb = −8,870 cal/g = −371 × 10³ J/kg
- 13 14 **Heat of Decomposition.** Not pertinent
- 13 15 **Heat of Solution.** Not pertinent
- 13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

OTC

OILS, EDIBLE: TUCUM

Common Synonyms

Aouara oil
American palm kernel oil
Palm seed oil
Tucum oil

Liquid | Light yellow | Weak odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** American palm kernel oil, Aouara oil, Palm seed oil
3 2 **Coast Guard Compatibility Classification.** Esters (13)
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Light yellow
4 3 **Odor:** Weak acid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Oil is essentially nontoxic. Contact with eyes causes mild irritation, and prolonged contact with skin may cause dermatitis
5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None known
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** 396°F C C
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Dry chemical foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing, water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Capital City Products Inc
P O Box 569
Columbus Ohio 43216

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not applicable
13 3 **Boiling Point at 1 atm:** Not pertinent (very high)
13 4 **Freezing Point:** 86°F = 30°C = 303°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.908 at 60°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 30°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 30°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** (est.) −15 500 Btu/lb = −8 600 cal/g = −360 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

OVG OILS, EDIBLE: VEGETABLE

Common Synonyms	Oily liquid	Pale yellow	Weak, fatty odor
	Floats on water		

Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Colorless to pale yellow
4 3 **Odor** Weak fatty

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield
5 2 **Symptoms Following Exposure:** None is listed
5 3 **Treatment for Exposure.** EYES flush with water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion:** None
5 7 **Late Toxicity** None
5 8 **Vapor (Gas) Irritant Characteristics.** None
5 9 **Liquid or Solid Irritant Characteristics.** None
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 610°F O C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents** Dry chemical foam or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature** Data not available
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Ashland Oil Co
Chemical Products Division
Peoria Ill 61601

2 Sherwin Williams Co
101 Prospect Ave
Cleveland Ohio 44101

3 A E Staley Manufacturing Co
Decatur Ill 62525

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

NFR

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight** Not pertinent
13 3 **Boiling Point at 1 atm** Not pertinent
13 4 **Freezing Point.** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 0 923 at 25°C (liquid)
13 8 **Liquid Surface Tension** (est) 25 dynes/cm = 0 025 N/m at 20 C
13 9 **Liquid-Water Interfacial Tension** (est) 30 dynes/cm = 0 03 N/m at 20 C
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion** (est) = -9 (BTU/lb) = -9 kcal/g = -37 x 10 J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

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OSX OILS, FUEL: 6

Common Synonyms
Bunker C oil
Residual fuel oil
No. 6

Thick liquid Black Tar odor

Usually floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

6 FIRE HAZARDS

6.1 **Flash Point:** > 150°F C.C.

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 765°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
24 hr open, 48 hr juvenile American shad
11 mg/l fresh water
24-72 mg/l 48 hr juvenile American shad
11 mg/l salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

Atlantic Richfield Co.
515 Fifth Ave.
New York, N.Y. 10022

Shell Oil Co.
1 Shell Plaza
Houston, Tex. 77001

Sun Oil Co.
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial

10.2 **Storage Temperature:** Heated

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NFU

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

12 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** 415° >> 1093°F = 212° >> 588°C = 485° >> 861°K

13.4 **Freezing Point:** 25 to 55°F = -4 to +13°C = 269 to 286°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.967 at 16°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** -18,000 Btu/lb = -10,000 cal/g = -419.68 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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OTW	# OILS, FUEL: 2

Common Synonyms Home heating oil	Oily liquid Yellow to brown Lube or fuel oil odor Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea vomiting
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Home heating oil
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO United Nations Numerical Designation:** 33 1223

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Light brown
4 3 **Odor:** Distinctive characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing, goggles or face shield
5 2 **Symptoms Following Exposure:** INHALATION causes headache and slight giddiness INGESTION causes nausea vomiting and cramps, depression of central nervous system ranging from mild headache to anesthesia, coma and death, pulmonary irritation, convulsions, convulsions, convulsions

OFR

OILS, FUEL: 4

Common Synonyms Residual fuel oil No 4	Oily liquid Dark Like or fuel oil odor Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard Label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Residual fuel oil No 4
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula.** Not applicable
3 4 **IMCO United Nations Numerical Designation:** 13 1223

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Brown
4 3 **Odor:** Characteristic like kerosene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Protective gloves goggles or face shield
5 2 **Symptoms Following Exposure:** INGESTION gastrointestinal irritation ASPIRATION pulmonary irritation is normally minimal but may become more severe several hours after exposure
5 3 **Treatment for Exposure:** INGESTION do NOT lavage or induce vomiting ASPIRATION treatment probably not required delayed development of pulmonary irritation can be detected by serial chest x rays consider prophylactic antibiotic regime if condition warrants EYES wash with copious quantities of water SKIN wipe off and wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion.** Grade 1 LD Not Determined mg kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** >130°F C C
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents** Dry chemical foam or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature** 500°F
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Average

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Atlantic Richfield Co
717 Fifth Ave
New York N Y 10022
2 Shell Oil Co
1 Shell Plaza
Houston Tex 77001
3 Sun Oil Co
St Davids Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

A I U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm.** 214 to >1092°F = 101 to >588°C = 374 to 861° K
13 4 **Freezing Point** −20 to +5°F = −29°C to −9 C = 244 to 264° K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity** 0 904 at 15°C (liquid)
13 8 **Liquid Surface Tension.** Data not available
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion** −17 440 Btu lb = −9 700 cal g = −406 1 × 10 J kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

CFV

OILS, FUEL: 5

Common Synonyms
Residual fuel oil
No. 5

Oily liquid Dark Strong lube oil odor

Usually floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Residual fuel oil No 5

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO United Nations Numerical Designation:** 33 1223

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Brown

4 3 **Odor:** Characteristic like kerosene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** INGESTION gastrointestinal irritation ASPIRATION pulmonary irritation is normally minimal but may become more severe several hours after exposure

5 3 **Treatment for Exposure:** INGESTION do NOT lavage or induce vomiting ASPIRATION treatment probably not required delayed development of pulmonary irritation can be [illegible] by serial chest x-rays consider prophylactic antibiotic regime if conditions warrant EYES wash with copious quantities of water SKIN wipe off and wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** No pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 1 LD50 [illegible] g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** None

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** > 130°F C.C.

6 2 **Flammable Limits in Air:** [illegible]

6 3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield Co
717 Fifth Ave
New York, N.Y. 10022

2 Shell Oil Co
1 Shell Plaza
Houston, Tex. 77001

3 Sun Oil Co
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Fuel oil No. 5 (heavy) Fuel oil No. 5 (light)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

XIU

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** 426° > 1062°F = 219° > 570°C = 492° > 843°K

13 4 **Freezing Point:** 0°F = -18°C = 255°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.936 at 16°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

*13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** [illegible]

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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OOD OILS, FUEL: 1-D

Common Synonyms Diesel oil (light)	Oily liquid	Yellow-brown	Like oil fuel oil odor
	Floats on water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook GG 446 4)

Mechanical containment
Should be contained
Neutralize and dispose of properly

2. LABELS

No hazard label required
Only Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diesel oil #2
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO United Nations Numerical Designation:** 1 270

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Light brown
4 3 **Odor:** Characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves goggles Face Shield
5 2 **Symptoms Following Exposure:** INHALATION causes headache and slight nausea INGESTION causes nausea vomiting colic purging depression of central nervous system headache anesthesia coma and death probably due to secondary pneumonia exhalation of odor signs of kidney and liver damage may be delayed ASPIRATION causes severe lung injury with cough gagging dyspnea cyanosis and rapid death pneumonia may develop and be fatal Vapor is irritating to eyes and respiratory tract
5 3 **Treatment for Exposure:** INGESTION If NOT induce vomiting Keep victim warm and quiet ASPIRATION call a physician at once Oxygen EYES wash with plenty of water SKIN remove contaminated clothing and wash skin thoroughly
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent or applicable
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 1 Dose 50 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Slight irritating effects in concentrations above 100 ppm for short exposure periods Highly concentrations The effect is cumulative
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause reddening and reddening of skin
5 10 **Odor Threshold:** 0 7 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** (60°) C.C.
6 2 **Flammable Limits in Air:**
6 3 **Fire Extinguishing Agents:** Dry chemical foam carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Not reactive
7 2 **Reactivity with Common Materials:** Not reactive
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 24 hr TL_m in Aerated Fresh Water
8 2 **Waterfowl Toxicity:** 5 day LD₅₀ mallard
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Atlantic Richfield Co
Philadelphia
New York, NY 10022
Sinclair Oil
Sinclair Plaza
Houston, Texas 77001
Sun Oil Co
Wayne, Pennsylvania

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical D 975-ASTM
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

ATU

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** 540°F = 282°C = 555°K
13 4 **Freezing Point:** -40°F = -40°C = 233°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.8 at 60°F/60°F (Water = 1)
13 8 **Liquid Surface Tension:** 23.32 dynes/cm = 0.0232 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** 47.89 dynes/cm = 0.0479 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** 150 Btu/lb = 83.3 cal/g = 349 J/g
13 13 **Heat of Combustion:** -19,560 Btu/lb = -10,870 cal/g = -45,500 J/g
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

OTD	# OILS, FUEL: 2-D

Common Synonyms Diesel oil, medium	Oily liquid Yellow-brown Like or fuel oil odor Floats on water
	[illegible]
Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Should be contained
Chemical and physical [illegible]

2 LABELS

No hazardous [illegible]
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diesel oil, medium

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** INGESTION causes [illegible] and vomiting; depression of [illegible] may progress to [illegible] and death. Symptoms include [illegible] pain, diarrhea, [illegible] and [illegible]. Symptoms may be delayed. ASPIRATION causes severe [illegible] with coughing, gagging, [illegible] substernal distress and rapidly developing pulmonary edema. Early signs of hemorrhagic [illegible] and pneumonitis include [illegible] and [illegible]. Systemic involvement is characterized by depression [illegible]

5.3 **Treatment for Exposure:** INGESTION: DO NOT induce vomiting. ASPIRATION: [illegible] Medical observation is indicated for evidence of delayed pulmonary edema. INHALATION: [illegible] SKIN: Remove contaminated clothing and wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** No [illegible] TLV established

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible] experience of exposure to vapor [illegible] high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Moderate [illegible] is noted if liquid is splashed and allowed to remain on skin, causing [illegible] and [illegible].

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, [illegible] water [illegible]

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]

7.5 **Polymerization:** [illegible]

7.6 **Inhibitor of Polymerization:** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** [illegible]

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** [illegible]

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** [illegible]

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

REVISED 1978

OON	# OILS, FUEL: NO. 1

Common Synonyms
Kerosene
Kerosene
Range oil
JP-1

Water: liquid Color: ... Kerosene odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Should be removed
Chemical and physical evaporation

2. LABELS

No hazard label required
Coast Guard Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** JP
Kerosene
Kerosene
Range oil

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation:** ... 1223

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** ... (Standard light brown)

4.3 **Odor:** (Characteristic)

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing, goggles or face shield

5.2 **Symptoms Following Exposure:** INGESTION causes irritation and gastrointestinal problems, such as nausea, vomiting, diarrhea and cramps. ASPIRATION causes eye irritation with coughing, gagging, dyspnea, pulmonary edema, chemical pneumonia and health developing pulmonary edema, gangrene, hemorrhage, consolidation and pneumonia appearing. Inhalation of vapor causes narcosis and depression.

5.3 **Treatment for Exposure:** INGESTION do NOT induce vomiting call physician. ASPIRATION get to fresh air, administer oxygen, call physician. EYES wash with plenty of water. SKIN wipe off and wash with soap & water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm (recommended)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 LD50 > 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** ... ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 100°F C.C.

6.2 **Flammable Limits in Air:** ... %

6.3 **Fire Extinguishing Agents:** Dry chemical, foam or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 444°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Moderate

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 24 ppm (96 hours) Flow-through

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 70% / 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Atlantic Richfield
... Penn Ave
New York, N.Y. 10022

Shell Oil Co
One Shell Plaza
Houston, Tex. 77002

Sun Oil Co
Sun Oil Bldg
Philadelphia, Pa. 19103

10 SHIPPING INFORMATION

10.1 **Grade or Purity:** Light hydrocarbon distillate (100%)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open or flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NFI

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
(Other Chemicals)	0
Water	0
Self Reactive	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** 350-550°F (177-288°C) (450-810°K)

13.4 **Freezing Point:** -45°F (-43°C) (230°K)

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.78-0.83 @ 60°F (liquid)

13.8 **Liquid Surface Tension:** 24-32 dynes/cm = 0.024-0.032 N/m @ 20°C

13.9 **Liquid-Water Interfacial Tension:** 45-50 dynes/cm = 0.045-0.050 N/m @ 20°C

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** -19,000 to -20,000 Btu/lb = -10,560 to -11,120 cal/g

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(continued on page 1445)

NOTES

REVISED 1978

OAS — OILS, MISCELLANEOUS: ABSORPTION

Common Synonyms
Absorbent oil

Liquid | Colorless to pale yellow | Fuel oil odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Hazardous if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Absorbent oil
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation:** 1270

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Pale yellow to colorless
4.3 **Odor:** Fuel oil odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles or face shield
5.2 **Symptoms Following Exposure:** INGESTION: irritation of stomach. INHALATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure. Delayed development can be detected by serial chest x-rays.
5.3 **Treatment for Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 1 [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin.
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible] mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Cities Service Co. Inc.
60 Wall Tower
New York, N.Y. [illegible]
2. Exxon Co.
Houston, Tex. [illegible]
3. Standard Oil Co. (Indiana)
910 S. Michigan Ave.
Chicago, Ill. 60605

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A T 1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** >302°F = >150°C = >423°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** (est.) 0.85 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** (est.) -19,000 Btu/lb = -10,000 cal/g = -420 x 10^3 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(continued on page 1 and 4)

NOTES

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OCT	OILS, MISCELLANEOUS: COAL TAR

Common Synonyms
Light oil

Liquid | Colorless to yellow | Pleasant odor

Floats on water. Flammable irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Foaming at shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:**
3.4 **IMCO United Nations Numerical Designation:**

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):**
4.2 **Color:**
4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:**
5.2 **Symptoms Following Exposure:**
5.3 **Treatment for Exposure:**
5.4 **Toxicity by Inhalation (Threshold Limit Value):**
5.5 **Short-Term Inhalation Limits:**
5.6 **Toxicity by Ingestion:**
5.7 **Late Toxicity:**
5.8 **Vapor (Gas) Irritant Characteristics:**
5.9 **Liquid or Solid Irritant Characteristics:**
5.10 **Odor Threshold:**

6 FIRE HAZARDS

6.1 **Flash Point:**
6.2 **Flammable Limits in Air:**
6.3 **Fire Extinguishing Agents:**
6.4 **Fire Extinguishing Agents Not to be Used:**
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:**
6.8 **Electrical Hazard:**
6.9 **Burning Rate:**

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:**
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:**
7.4 **Neutralizing Agents for Acids and Caustics:**
7.5 **Polymerization:**
7.6 **Inhibitor of Polymerization:**

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
8.2 **Waterfowl Toxicity:**
8.3 **Biological Oxygen Demand (BOD):**
8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
10.2 **Storage Temperature:**
10.3 **Inert Atmosphere:**
10.4 **Venting:**

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid and Solid Irritant	
Poison	
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aquatic Effect	4
Reactivity	
Other Chemicals	2
Water	0
Self Reactive	0

12.3 **NFPA Hazard Classifications:**

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:**
13.2 **Molecular Weight:**
13.3 **Boiling Point at 1 atm:**
13.4 **Freezing Point:**
13.5 **Critical Temperature:**
13.6 **Critical Pressure:**
13.7 **Specific Gravity:** at 20°C (liquid)
13.8 **Liquid Surface Tension:**
13.9 **Liquid-Water Interfacial Tension:**
13.10 **Vapor (Gas) Specific Gravity:**
13.11 **Ratio of Specific Heats of Vapor (Gas):**
13.12 **Latent Heat of Vaporization:**
13.13 **Heat of Combustion:**
13.14 **Heat of Decomposition:**
13.15 **Heat of Solution:**
13.16 **Heat of Polymerization:**

NOTES

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OCR

OILS, MISCELLANEOUS: CROTON

Common Synonyms

Croton tiglium oil
Croton oil

Liquid | Dark | Unpleasant odor

Floats on water

AVOID CONTACT WITH LIQUID KEEP PEOPLE AWAY
Stop discharge if possible
Shut off dependents
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible

Extinguish with dry chemical, CO2, foam, carbon dioxide, or sand
Water may be ineffective on fire

Exposure

CALL FOR MEDICAL AID

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes

Remove contaminated clothes and shoes
Flush affected eyes with plenty of water
IF IN EYES hold lids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.

Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Croonoil, *Croton tiglium L.* oil
3 2 **Coast Guard Compatibility Classification** Esters (13)
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Dark
4 3 **Odor:** Unpleasant acrid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield, rubber gloves and any other protective clothing to prevent contact with skin

5 2 **Symptoms Following Exposure** Contact of liquid with eyes causes severe irritation. May induce severe skin irritation, inflammation, swelling, and pustule formation. Absorption through the skin may cause purging. Ingestion causes burning of the mouth and stomach and drastic purging, possibly leading to collapse and death. Small doses have a strong laxative effect

5 3 **Treatment for Exposure:** EYES flush with water and 2% hydrocortisone ointment is recommended. SKIN remove as much liquid as possible, from skin by use of a good solvent such as acetone or alcohol, wash with soap and water. INGESTION for gastrointestinal symptoms use demulcents, further treatment is symptomatic, do NOT induce vomiting

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, LD_{50} <50 mg/kg

5 7 **Late Toxicity:** Has been used in cancer research as a promoter for other compounds that cause skin cancer

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Data not available
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Consolidated Midland Corporation
195 East Main Street
Brewster, N. Y. 10509

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 2 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm** Not pertinent (very high)
13 4 **Freezing Point.** 0 to 18°F = −18 to −8°C = 255 to 265°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** (est.) 0.946 at 15°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** (est.) −16 800 Btu/lb = −9,300 cal/g = −390 × 10³ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

OLS OILS, MISCELLANEOUS: LINSEED

Common Synonyms			
Flaxseed oil Raw linseed oil Linseed oil	Liquid Floats on water	Light yellow to dark yellow	Paint like odor

Stop discharge if possible
Call fire department
Isolate and deny access to discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam, carbon dioxide
water may be ineffective on fire

Exposure

LIQUID
Not harmful
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and pollution control agencies
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Flaxseed oil, Raw linseed oil
3 2 **Coast Guard Compatibility Classification** Esters (13)
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow to dark amber
4 3 **Odor:** Like oil base paint

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Contact of liquid with eyes causes mild irritation. Prolonged contact with skin can cause dermatitis. Ingestion of large doses (over 1 oz) has laxative effect
5 3 **Treatment for Exposure.** EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: do NOT induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion.** Grade 0. $LD_{50} > 15$ g/kg
5 7 **Late Toxicity:** Liver damage in rats (from addition of oil to diet)
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 535°F O.C., 401°F C.C.
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing, water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 650°F
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Cargill Inc
Cargill Building
Minneapolis, Minn. 55402

2 PVO International, Inc
416 Division Street
Boonton, N. J. 07005

3 Textron, Inc.
Spencer Kellogg Division
120 Delaware Ave
Buffalo, N. Y. 14240

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Raw grade, varnish grade, grinding grade, heat bodied grade, blown grade
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-L

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm** Not pertinent (very high)
13 4 **Freezing Point** −2°F = −19°C = 254°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 0.932 at 20°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion** −16,800 Btu/lb = −9,300 cal/g = −390 × 10⁶ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

OLB — OILS, MISCELLANEOUS: LUBRICATING

Common Synonyms
Crankcase oil
Transmission oil
Motor oil

Oily liquid | Yellow-brown | Lube oil odor

Floats on water

Stop discharge if possible
Notify fire department
Avoid contact with liquid
Isolate and remove discarded material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, CO2, foam or water fog
Water may be ineffective
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing
Wash skin thoroughly with plenty of water
IF IN EYES hold eyelids apart and flush with water
IF SWALLOWED and victim is CONSCIOUS have victim drink water
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Crankcase oil
Motor oil
Transmission oil

3 2 **Coast Guard Compatibility Classification** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO United Nations Numerical Designation** 3 3/1270

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Yellow fluorescent

4 3 **Odor:** Characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Protective gloves goggles or face shield

5 2 **Symptoms Following Exposure:** INGESTION minimally gastrointestinal tract irritation increased frequency of bowel passage may occur ASPIRATION pulmonary irritation is normally minimal but may become more severe several hours after exposure

5 3 **Treatment for Exposure** INGESTION do NOT induce vomiting ASPIRATION treatment probably not required delayed development of pulmonary irritation can be detected by serial chest x-rays EYES wash with copious quantities of water SKIN wipe off and wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD50 5 to 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 300°F-450°F C C

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** 500°F 700°F

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Shell Oil Co
1 Shell Plaza
Houston Tex 77001

2 Standard Oil Co (Indiana)
910 S Michigan Ave
Chicago Ill 60605

3 Sun Oil Co
St Davids Pa 19087

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Various viscosities

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A 1-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm** Very high

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** (est) 0 902 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 36 37 dynes/cm = 0 036-0 037 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** 33 54 dynes/cm = 0 033-0 054 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion.** −(18 486 Btu/lb = −10 270 cal/g = −429 98 × 10^3 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

OMN — OILS, MISCELLANEOUS: MINERAL

Common Synonyms
White oil
Liquid Petrolatum

Oily liquid — Colorless — Odorless

Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and restrain discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam or carbon dioxide
Water may be ineffective in fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids apart and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Liquid petrolatum
White oil

3.2 **Coast Guard Compatibility Classification**
Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO/United Nations Numerical Designation:** 13/1270

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Very faint

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield

5.2 **Symptoms Following Exposure** Ingestion of liquid can cause very loose bowel movements

5.3 **Treatment for Exposure.** If EYES wash with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ 5 to 15 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** None

5.10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point.** 380 F OC

6.2 **Flammable Limits in Air** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** 500-700 F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Shell Oil Co
One Shell Plaza
Houston, Tex 77001
2. Standard Oil Co (Indiana)
910 S Michigan Ave
Chicago, Ill 60605
3. Sun Oil Co
St Davids, Pa 19087

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial refined

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook G 446-3)

V T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight** Not pertinent

13.3 **Boiling Point at 1 atm** Very high

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.822 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 27 dynes/cm = 0.027 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 47 dynes/cm = 0.047 N/m at 70°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

OMS — OILS, MISCELLANEOUS: MINERAL SEAL

Common Synonyms
Long time burning oil
300° oil
Mineral colza oil

Oily liquid — Colorless to yellow — Kerosene odor

Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Long time burning oil
Mineral colza oil
300° oil
Signal oil

3.2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula** Not applicable

3.4 **IMCO United Nations Numerical Designation** 3.3/1270

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to light brown

4.3 **Odor:** Like kerosene

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles or face shield

5.2 **Symptoms Following Exposure** Vapors cause slight irritation of eyes and nose. Liquid irritates stomach; if taken in lungs causes coughing, distress, and rapidly developing pulmonary edema

5.2 **Treatment for Exposure:** ASPIRATION enforced bed rest, administer oxygen, call a doctor. INGESTION: do NOT induce vomiting, have victim drink water or milk. EYES wash with copious amounts of water. SKIN wipe off, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 200 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** Grade 2, LD_{50} 0.5 to 5 g/kg

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor cause slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5.10 **Odor Threshold.** 1 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** 150.2°SF.O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents** Dry chemical foam or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Shell Oil Co
One Shell Plaza
Houston, Tex. 77001
2. Standard Oil Co. (Indiana)
910 S. Michigan Ave.
Chicago, Ill. 60680
3. Sun Oil Co.
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Several grades of varying pour points, all highly refined

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A.F.U.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm** > 500°F = > 260°C = > 533 K

13.4 **Freezing Point.** 100°F = −122°C = 261.0 K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** 0.811-0.828 at 15.6°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 28 dynes/cm = 0.028 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 47.50 dynes/cm = 0.047 0.050 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion.** (est.) −19,000 Btu/lb = −10000 cal/g = −420 × 10³ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 7 of 8

NOTES

REVISED 1978

OMT — OILS, MISCELLANEOUS: MOTOR

Common Synonyms
Crankcase oil
Lubricating oil

Oily liquid | Yellow brown | Lube oil odor

Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Crankcase oil
Lubricating oil
Transmission oil

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO/United Nations Numerical Designation** 3 07/1270

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Yellow fluorescent

4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** INGESTION minimal gastrointestinal irritation, increased frequency of bowel passage may occur. ASPIRATION pulmonary irritation is normally minimal but may become more severe several hours after exposure

5 3 **Treatment for Exposure:** INGESTION do NOT lavage or induce vomiting. ASPIRATION treatment probably not required, delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES wash with copious amounts of water. SKIN wipe off oil and wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD50 to 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 275-600°F C.C.

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical, foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature:** 325-625°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Shell Oil Co
1 Shell Plaza
Houston, Tex. 77001

2 Standard Oil Co. (Indiana)
910 S. Michigan Ave.
Chicago, Ill. 60605

3 Sun Oil Co.
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Various viscosities

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-1 U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:**
-29.9°F = -34.4°C = 238.8°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.84-0.96 at 15°C (liquid)

13 8 **Liquid Surface Tension:** 30-35 dynes/cm = 0.030-0.035 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** 33-34 dynes/cm = 0.033-0.034 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** ~-18,480 Btu/lb = ~-10,270 cal/g = ~-429.98 × 10^3 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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ONF	OILS, MISCELLANEOUS: NEATSFOOT

Common Synonyms	Oily liquid; Pale yellow; Peculiar odor Floats on water
	Stop discharge if possible Call fire department Isolate and remove all fire sources Notify local health and pollution control agencies
Fire	Combustible Extinguish with dry chemical, CO2, or dry sand Water may be ineffective
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow
4 3 **Odor:** Peculiar

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Data not available
5 2 **Symptoms Following Exposure:** May cause dermatitis in sensitive individuals (humans)
5 3 **Treatment of Exposure:** Data not available
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 0. LD$_{50}$ absence 15 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 430°F O.C. - 470°F C.C.
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents.** Foam, dry chemical, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** 828°F
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Atlas Refinery Inc.
142 Lockwood St.
Newark, NJ 07105

2 Neatsfoot Oil Refineries Corp.
East Ontario and Bach Sts.
Philadelphia, Pa. 19134

3 Arthur C. Trask Corp.
7300 W. 51st
Argo, Ill. 60501

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Various grades designated by pour point (20°-40°), also various refined grades
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

X I I

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Very high
13 4 **Freezing Point:** 32°-14°F = 0°-(-10°)C = 273-263°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.915 at 16°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

REVISED 1978

OPT — OILS, MISCELLANEOUS: PENETRATING

Common Synonyms	Oily Sepia	Yellow	Motor oil-like odor
	Floats on water		

No discharge if possible
Advise depty mpcf
Avoid contact with liquid
Isolate water areas affected
Notify local health and pollution control agencies

Fire	Combustible Extinguish with [illegible] by [illegible] Water may be ineffective
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelids apart and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, administer drink of water emesis DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and pollution control agencies Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Preservative oil
Water displacing oil

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO United Nations Numerical Designation** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Yellowish

4 3 **Odor:** Like petroleum oil

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Liquid may irritate stomach and intestinal tract if swallowed; movements

5 3 **Treatment for Exposure:** INGESTION Induce vomiting with warm drink water or milk. Do NOT induce vomiting
ASPIRATION check for delayed development of pulmonary edema; administer oxygen if necessary
EYES wash thoroughly with clean water SKIN wipe off, wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 Data Sheeting Agent

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause matting and reddening of skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 245 F

6 2 **Flammable Limits in Air.** Data not available

6 3 **Fire Extinguishing Agents** Foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water or jet may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** Not known

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Ashland Petroleum Co
1401 Winchester Ave
Ashland, Ky 41101

Penreco Inc
Butler, Pa 16001

Standard Oil Co (Indiana)
910 S Michigan Ave
Chicago, Ill 60605

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

X U 1

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.5961 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 29.8 dynes/cm = 0.0298 N/m at 24°C

13 9 **Liquid-Water Interfacial Tension:** 5.5 dynes/cm = 0.0055 N/m at 22°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** [illegible]

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

ORG	OILS, MISCELLANEOUS: RANGE

Common Synonyms
Kerosene
Kerosene
Fuel oil No. 1
JP-1

Waters liquid | Colorless | Kerosene odor

Floats on water

Fire

Combustible

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 448-4

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No. 1 Fuel Oil
JP-1
Kerosene
Kerosine

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO/United Nations Numerical Designation:** 1223

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor.** Like kerosene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Vapor causes slight irritation to eyes and nose. Liquid irritates stomach if taken internally; causes coughing, distress and rapidly developing pulmonary edema

5 3 **Treatment for Exposure.** ASPIRATION: Keep patient quiet; administer oxygen; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ > 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause slight smarting of eyes and respiratory system if present in high concentrations. The effects are rapid.

5 9 **Liquid or Solid Irritant Characteristics:** Mild hazard. Repeated washing and allowed to remain may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** 1 ppm

6 FIRE HAZARDS

6 1 **Flash Point** 100°F C.C.

6 2 **Flammable Limits in Air.** 0.7% - 5%

6 3 **Fire Extinguishing Agents** Foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** 444°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Average rate

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
2,000 ppm 24 hr. Sunfish, Flow fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Not Known

8 4 **Food Chain Concentration Potential.**
None

9 SELECTED MANUFACTURERS

Shell Oil Co.
One Shell Plaza
Houston, Texas 77002

Standard Oil Co. (Indiana)
200 N. Michigan Ave.
Chicago, Illinois 60601

Sun Oil Co.
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Light hydrocarbon distillate (99%)

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 448-3

X F I

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight** Not pertinent

13 3 **Boiling Point at 1 atm**
302 °API = 288-260 °C = 473-533 °K

13 4 **Freezing Point** -40 °F
= -40 °C = 230 to 225°K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 0.8821 at 20 °C/water

13 8 **Liquid Surface Tension.**
23.42 dynes/cm = 0.02342 N/m at 20 °C

13 9 **Liquid-Water Interfacial Tension.**
47.49 dynes/cm = 0.0475 N/m at 20 °C

13 10 **Vapor (Gas) Specific Gravity**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization.**
105 Btu/lb = Not Known = 2.51 × 10^5 J/kg

13 13 **Heat of Combustion** -19,540 Btu/lb
= -10,860 cal/g = -454.24 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Data at other temperatures

NOTES

REVISED 1978

ORS | OILS, MISCELLANEOUS: RESIN

Common Synonyms
Rosin oil
Retinol
Resinol
Colsol

Liquid | Light amber to red to black | Pinetree pitch odor

Floats on water

Fire

Combustible

Exposure

Exposure data not available

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Colsol
Retinol
Resinol
Rosinol

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO United Nations Numerical Designation** 3 2 1266

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Light amber to red to black depending on grade

4 3 **Odor:** Characteristic pine tree pitch

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Data not available

5 2 **Symptoms Following Exposure:** Data not available

5 3 **Treatment for Exposure:** Data not available

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available but toxicity is probably low

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 255 to 310 F (C)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 446 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Crosby Chemicals Inc
Picayune Miss 39466

2 Cosmic Hydrocarbon Chemicals Co
271 Madison Ave
New York N Y 10016

3 Natrochem Inc
Savannah Ga 31402

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Variety of grades that differ primarily in color and flash point

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

A I 1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	*
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** 572-590 F = 300-310°C = 573-583°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.95-1.02 at 15°C (liquid)

13 8 **Liquid Surface Tension** 32-35 dynes/cm = 0.032 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** 26-30 dynes/cm = 0.03 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) = 18,000 Btu/lb = -10,000 cal/g = -420 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next Card

NOTES

REVISED 1378

ORD — OILS, MISCELLANEOUS: ROAD

Common Synonyms
Slow curing asphalt
Petroleum asphalt
Liquid asphalt

Oily liquid | Black | Tar odor

Floats on water

Fire

Combustible

Exposure

UNUSUAL
LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Liquid asphalt
Petroleum asphalt
Slow-curing asphalt

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO United Nations Numerical Designation:** 3 2 1999 3 3 1999

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Dark brown to black

4 3 **Odor:** Tarry

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing for hot asphalt, face and eye protection when hot

5 2 **Symptoms Following Exposure:** Contact with skin may cause dermatitis. Inhalation of vapors may cause moderate irritation of nose and throat. Hot liquid burns skin.

5 3 **Treatment for Exposure:** Severe burns may result from hot liquid. Cool the skin at once with water. Cover burn with sterile dressing and seek medical attention.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Some oil

5 5 **Short-Term Inhalation Limit:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 [illegible]

5 7 **Late Toxicity:** None observed

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 300 +°F

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 400 °to F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Johns Manville Co
Greenwood Plaza
Denver, Colo 80217

2 Sun Oil Co
St Davids, Pa 19087

3 Witco Chemical Corp
Pioneer Division
277 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

*10 1 **Grades or Purity:** SC 400 to SC 3

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

X I I

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	4
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

*13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.0-1.2 at 25°C (liquid)

13 8 **Liquid Surface Tension:** (est) 25 dynes/cm = 0.025 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est) 50 dynes/cm = 0.05 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est) = -18 000 Btu/lb = -10 000 cal/g = -420 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

ORN — OILS, MISCELLANEOUS: ROSIN

Common Synonyms
Resin oil
Retinol
Resinol
Colophol

Liquid | Light amber to red to black | Pinetree pitch odor

Floats on water

Fire

Combustible

Exposure

Exposure data not available

Water Pollution

Effect of low concentrations on aquatic life unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No Standard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Colophol
Pennant
Retinol
Resinol

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO United Nations Numerical Designation:** 3 2 1256

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Light amber to red to black depending on grade

4 3 **Odor:** Characteristic pine pitch odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Data not available

5 2 **Symptoms Following Exposure:** Data not available

5 3 **Treatment for Exposure:** Data not available

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** No data available but toxicity probably low

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 218 [illegible] C C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Foam
dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Data not available

6 6 **Behavior in Fire:** Data not available

6 7 **Ignition Temperature:** [illegible]

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible] Chemical Co.
Peabody, Massachusetts

Arnold Hoffman & Co., Inc.
[illegible] Madison Ave.
New York, N.Y. [illegible]

[illegible] Co.
Savannah, Georgia

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Various grades that differ primarily in color and flash point

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

X T

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reactive	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** [illegible]

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible]

13 8 **Liquid-Surface Tension:** [illegible]

13 9 **Liquid-Water Interfacial Tension:** [illegible]

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** [illegible]

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

REVISED 1978

OSP — OILS, MISCELLANEOUS: SPERM

Common Synonyms

Oily liquid — Pale yellow

Floats on water

Stop discharge if possible
Dike for containment
Absorb on sand or other inert material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam or carbon dioxide
Water may be ineffective

Exposure

CALL FOR MEDICAL AID
Exposure data not available
Extinguish with dry chemical, foam or carbon dioxide

Water Pollution

Effect of low concentrations on aquatic life is unknown
Foulant to shorelines
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available
5.2 **Symptoms Following Exposure:** Data not available
5.3 **Treatment for Exposure:** Data not available
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available. Not toxicity is probably low
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 420°F (C.C.) (No. 1)
360°F (C.C.) (No. 2, 4, 5, 6) (ASTM D 93)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water in a solid stream may spread fire
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not reported
6.7 **Ignition Temperature:** No. 1 Not reported
5.8 **Electrical Hazard:** Not pertinent
5.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Not Basic Material
Boston, Mass.
Newark, N.J. Refinery, Co.
Los Angeles and Bayonne
Philadelphia, Pa. (Refined)
Atlantic Trade Corp.
New York, N.Y.
Not Listed

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** No. 1 Not specified, should be of low flash point
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, G-446-3

A.T.1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity** 0.882 at 20°C (Liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** 5.7 dynes/cm = 0.0057 N/m at 30°C
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kJ/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 3

NOTES

REVISED 1978

OSD — OILS, MISCELLANEOUS: SPINDLE

Common Synonyms
High speed bearing oil
Bearing oil

Oily liquid — Light brown — Weak kerosene-like odor

Floats on water

[illegible]

Fire

Combustible

[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed

[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-448-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bearing oil
High speed bearing oil

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Light brown

4.3 **Odor:** Weak kerosene-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective glasses, goggles or face shield

5.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach. Upset stomach, causes coughing, distress and rapidly developing pulmonary edema

5.3 **Treatment for Exposure:** INHALATION remove victim to fresh air. Call a doctor. INGESTION do NOT induce vomiting. Call a doctor. EYES wash with copious amounts of water. SKIN wipe off and wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of eyes and nose; respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 450°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] ppm in 24 hr Bioassay [illegible] fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):**
[illegible] 5 days

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1. Keystone Lubricating Co
[illegible] and Lippincott Streets
Philadelphia, Pa. 19132

2. Penreco, Inc.
Butler, Pa. 16001

3. White and Bagley Co.
Worcester, Mass. 01610

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Several grades available with same hazard assessment

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-448-3

X T I

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** Very high

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.881 at 15°C (liquid)

13.8 **Liquid Surface Tension:**
Data not available

13.9 **Liquid-Water Interfacial Tension:**
Data not available

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization:**
Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 2 and 3

NOTES

REVISED 1978

OSY — OILS, MISCELLANEOUS: SPRAY

Common Synonyms			
Plant spray oil Dormant oil Foliage oil	Oily liquid	Light brown	Kerosene-like odor

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with foam, dry chemical, carbon dioxide
Water may be ineffective on fire

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing. Use gloves
Flush affected areas with plenty of water
If IN EYES, hold eyelids open and flush with plenty of water
If SWALLOWED, and victim is CONSCIOUS, have victim drink milk or milk of magnesia
DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Dormant oil
Foliage oil
Kerosene, heavy
Plant spray oil

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula** Not applicable

3 4 **IMCO/United Nations Numerical Designation:** 3.3/1270

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless to light brown

4 3 **Odor** Like kerosene, like fuel oil

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Protective gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach. If taken into lungs, causes coughing, distress, and rapidly developing edema

5 3 **Treatment for Exposure:** ASPIRATION, enforce bed rest, administer oxygen, call a doctor. INGESTION, do NOT induce vomiting, call a doctor. EYES, wash with copious amounts of water. SKIN, wipe off and wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 2, LD_{50} 0.5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** 1 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 140°F (min) CC

6 2 **Flammable Limits in Air** 0.6% - 4.6%

6 3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** 475°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 500 ppm/* salmon fingerling lethal fresh water
*Time period not specified

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)** 53% 5 days

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Shell Oil Co
1 Shell Plaza
Houston, Tex 77002

2 Standard Oil Co (Indiana)
910 S Michigan Ave
Chicago, Ill 60605

3 Sun Oil Co
St Davids, Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-3 U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1 2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** 590-700°F = 310-371°C = 583-644°K

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 0.82 at 15°C (liquid)

13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** (est.) 50 dynes/cm = 0.05 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** −18 580 Btu/lb = −10 300 cal/g = −431.24 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

OTL — OILS, MISCELLANEOUS: TALL

Common Synonyms

Oils liquid Yellow Characteristic odor

Floats on water

Stop discharge if possible
Call fire departments
Avoid contact with liquid
Contain and remove discharged material
Notify local health, pollution control agencies

Fire

Combustible
Extinguish with foam, dry chemical or carbon dioxide
Water may be ineffective on fire

Exposure

CALL FOR MEDICAL AID
Exposure data not available
Flush affected areas with water

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify operators of affected water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped,** Liquid
4 2 **Color:** Yellow
4 3 **Odor:** Characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Data not available
5 2 **Symptoms Following Exposure** Data not available
5 3 **Treatment for Exposure:** Data not available
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 300°F OC
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Foam dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature** Data not available
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Georgia Pacific Corp
Commonwealth Bldg
Portland Ore 97204

2 SCM Corp
Glidden Durkee Division
900 Union Commerce Bldg
Cleveland Ohio 44115

3 Union Camp Corp
Chemical Division
Jacksonville Fla 32205

10. SHIPPING INFORMATION

10 1 **Grades or Purity** Various grades which differ primarily in the relative content of fatty acids and rosin acids
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

X T-1

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm** Very high
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature.** No pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.951 at 16°C (liquid)
13 8 **Liquid Surface Tension** 34.3 dynes/cm = 0.0343 N/m at 24°C
13 9 **Liquid Water Interfacial Tension** 11 dynes/cm = 0.011 N/m at 22.5°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** (est.) −18,000 Btu/lb = −10,003 cal/g = −420 × 10³ J/kg
13 14 **Heat of Decomposition** No pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on page 40A)

NOTES

REVISED 1978

OTN — OILS, MISCELLANEOUS: TANNER'S

Common Synonyms Sulfated beatsfoot oil	Oily liquid

Not pertinent

Fire	Combustible Extinguish with dry chemical, carbon dioxide, or foam Water may be ineffective
Exposure	ATT FOR MEDICAL AID Exposure data not available Flash, fire or explosion may cause burns
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Not pertinent

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Data not available

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Sulfated neatsfoot oil sodium salt

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula.** Not applicable

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Data not available

4 2 **Color** Data not available

4 3 **Odor** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Data not available

5 2 **Symptoms Following Exposure:** Data not available

5 3 **Treatment for Exposure.** Data not available

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 0 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Data not available

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9. SELECTED MANUFACTURERS

1 Diamond Shamrock Corp
Suspol Chemicals Division
Morristown, N J 07960

2 Reilly Whiteman Inc
Conshohocken, Pa 19428

3 Arthur C Trask Corp
7666 W 63 St
Argo, Ill 60501

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T C

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm** Very high

13 4 **Freezing Point:** Data not available

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (est.) 0.85 at 20°C (liquid)

13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** (est.) 50 dynes/cm = 0.05 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) −18 000 Btu/lb = −10 000 cal/g = −420 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(Continued on page 5 and 6)

NOTES

REVISED 1978

OTF — OILS, MISCELLANEOUS: TRANSFORMER

Common Synonyms
Insulating oil
Electrical insulating oil
Petroleum insulating oil

Oily liquid Colorless to light brown Motor oil-like odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Electrical insulating oil
Insulating oil
Petroleum insulating oil

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO/United Nations Numerical Designation:** 3 3/1270

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to light brown

4 3 **Odor:** Like motor oil

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Protective gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Ingestion of liquid may irritate stomach and cause increased frequency of bowel movements. If taken into lungs, can cause pulmonary irritation may occur

5 3 **Treatment for Exposure:** INGESTION: do NOT induce vomiting. ASPIRATION: check for delayed irritation by serial X rays. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1, LD50 to 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point**

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Foam, dry chemical, or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Shell Oil Co
1 Shell Plaza
Houston, Tex 77001

2 Standard Oil Co (Indiana)
910 S Michigan Ave
Chicago, Ill 60605

3 Sun Oil Co
St Davids, Pa 19087

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm** Very high

13 4 **Freezing Point:** −75°F = −59°C = 214°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.891 at 15°C (liquid)

13 8 **Liquid Surface Tension** Data not available

13 9 **Liquid-Water Interfacial Tension:** 49 dynes/cm = 0.049 N/m at 25°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

OTB OILS, MISCELLANEOUS: TURBINE

Common Synonyms
Steam turbine oil
Steam turbine lube oil
Turbine oil

Liquid | Colorless to light brown | Kerosene-like odor

Floats on water

Fire

Combustible

Exposure

VAPOR
Irritating to eyes nose and throat

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Steam turbine oil, Steam turbine lube oil
3 2 **Coast Guard Compatibility Classification:** Petroleum oils (12)
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless to pale brown
4 3 **Odor:** Weak, like lube oil

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure:** Contact with liquid causes slight irritation of eyes and (on prolonged contact) skin Ingestion causes slight irritation of stomach and bowel, increased frequency of bowel movement
5 3 **Treatment for Exposure:** EYES wash with copious quantity of water for at least 15 min SKIN wipe off, wash with soap and water INGESTION do NOT induce vomiting do NOT lavage 2-4 oz olive oil and 1-2 oz activated charcoal may be given
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 0 LD_{50} > 15 g/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 390 - 485°F O C
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Dry chemical foam carbon dioxide, water fog
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing, water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 700°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** (approx.) 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Shell Oil Co
One Shell Plaza
Houston Texas 77002

2 Exxon Co
P O Box 2180
Houston, Texas 77001

3 Sun Oil Co
P O Box 426
Marcus Hook Pa 19061

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Solvent refined paraffinic oils 98 N+% Grades vary in viscosity and flash point
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.87 at 20°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** (est.) −17 600 Btu/lb = −9 800 cal/g = −410 × 10 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

OLA	# OLEIC ACID

Common Synonyms cis-9 Heptadecylenecarboxylic acid cis-9 Octadecenoic acid cis-9-Octadecylenic acid Red oil	Liquid	Colorless to pale yellow	Mild odor
	Floats on water		
	[illegible]		
Fire	Combustible [illegible]		
Exposure	[illegible] LIQUID Irritating to skin and eyes If swallowed will cause nausea [illegible]		
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]		

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** cis-9 Heptadecylene carboxylic acid; cis-9 Octadecenoic acid; cis-9-Octadecylenic acid; Red oil

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $CH_3(CH_2)_5CH{=}CH(CH_2)_7COOH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Pale

4 3 **Odor:** [illegible]

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Impervious gloves, goggles or face shield, impervious apron

5 2 **Symptoms Following Exposure:** Industrial use of compound involves no known hazards. Ingestion causes mild irritation of mouth and stomach. Contact with eyes or skin causes mild irritation

5 3 **Treatment for Exposure:** INGESTION: give large amount of water. EYES: if eye irritation occurs, flush with water and get medical attention. SKIN: wash thoroughly with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD_{50} > 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 390–425°F (O.C.)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 685°F

6 8 **Electrical Hazard.** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Union Camp Corp.
2051 N. Lane Ave.
Jacksonville, Fla. 32206

2 Hercules Inc.
Wilmington, Del. 19899

3 Armak Chemicals Div.
Box 1805
Chicago, Ill. 60690

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial 70–83%

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A I U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 277 (avg.)

13 3 **Boiling Point at 1 atm:** 432°F = 222°C = 495°K

13 4 **Freezing Point:** 57°F = 14°C = 287°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.89 at 25°C (liquid)

13 8 **Liquid Surface Tension.** 32.8 dynes/cm = 0.0328 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** 15.59 dynes/cm = 0.01559 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 103 Btu/lb = 57 cal/g = 2.4 × 10⁵ J/kg

13 13 **Heat of Combustion.** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

OAP OLEIC ACID, POTASSIUM SALT

Common Synonyms			
Potassium oleate	Solid or liquid	Brown	Soapy odor
	Sinks and mixes slowly with water		

Avoid contact with liquid and solid. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with water, dry chemicals, CO_2, foam, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

LIQUID OR SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Potassium oleate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $C_{17}H_{33}COOK$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid
4.2 **Color:** Brown
4.3 **Odor:** Faint soapy

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles and rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat, coughing and sneezing. Ingestion causes mild irritation of mouth and stomach. Contact with eyes causes irritation.
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water. EYES: flush with copious quantities of tap water for 15 min. and seek appropriate medical attention. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** 140°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Diamond Shamrock Chemical Co.
1100 Superior Ave.
Cleveland, Ohio 44114
2. Alco Chemical Corp.
Trenton Avenue and William Street
Philadelphia, Pa. 19134

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 10% solution in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

(liquid) A P
(solid) SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid
13.2 **Molecular Weight:** 320 (solute only)
13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13.4 **Freezing Point:** 455°–464°F = 235°–240°C = 508°–513°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** >1.1 at 20°C (solid + liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

OAC

OLEIC ACID, SODIUM SALT

Common Synonyms			
Lunatrol Sodium oleate	Solid	Light tan	Slight tallow like odor
	Sinks and mixes slowly with water		

Fire	Combustible
Exposure	CALL FOR MEDICAL AID SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lunatrol Sodium oleate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{17}H_{33}COONa$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Light tan

4 3 **Odor:** Slight tallow like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask and gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat coughing and sneezing Ingestion causes mild irritation of mouth Contact with eyes causes irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amount of water EYES flush with copious quantities of tap water SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Diamond Shamrock Chemical Co
1100 Superior Ave
Cleveland Ohio 44114

2 Witco Chemical Corp
Organics Division
277 Park Avenue
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 304 (approx.)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 450°-455°F = 232°-235°C = 505°-508°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** >1 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

OLM

OLEUM

Common Synonyms
Fuming sulfuric acid

Oily liquid Colorless to cloudy Sharp choking odor

Mixes and reacts with water producing heat Irritating mist is produced

AVOID CONTACT WITH LIQUID AND MIST. Keep people away.
Wear protective equipment with self-contained breathing apparatus.
Stop leak if possible.
Notify local authorities if spill enters water.
Isolate hazard area and deny entry.
Keep unnecessary people away; isolate hazard area and deny entry.
Ventilate closed spaces before entering.
Keep combustibles away from spilled material.

Fire

Not flammable
May cause fire on contact with combustibles
Flammable gas may be produced on contact with metals
Use dry chemical, CO2, water spray or foam to extinguish surrounding fire.
DO NOT USE WATER ON ADJACENT FIRES.

Exposure

CALL FOR MEDICAL AID

MIST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, and victim is CONSCIOUS, give water to drink.
Induce vomiting.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify public if on navigable waters.
Notify agencies if on navigable waters.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning; isolate.
Restrict access.
Chemical and physical treatment.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Fuming sulfuric acid
3.2 **Coast Guard Compatibility Classification:** Inorganic acid
3.3 **Chemical Formula:** $SO_3 \cdot H_2SO_4$
3.4 **IMCO United Nations Numerical Designation:** NO DATA

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to cloudy
4.3 **Odor:** Sharp penetrating choking

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator approved by U.S. Bureau of Mines for acid mists, rubber gloves, plastic apron, eye wash, quick drench shower, rubber footwear, face shield.

5.2 **Symptoms Following Exposure:** Vapor irritating to eyes, nose and throat. Liquid causes severe burns to skin and eyes.

5.3 **Treatment for Exposure:** INGESTION: Induce vomiting as directed. Do NOT induce vomiting if victim is convulsing. EYES: Flush with plenty of water for at least 15 minutes. Call a doctor. SKIN: Flush with plenty of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** Severe burns. Death and stomach perforation.

5.7 **Late Toxicity:** None.

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. Effects cannot be detected even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact. Very irritating to the eyes.

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Avoid use of water on adjacent fires.
6.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Vigorous reaction with water; spatter.
7.2 **Reactivity with Common Materials.** May react with cast iron with explosive violence. Attacks many metals releasing flammable hydrogen gas. Capable of igniting finely divided combustible material on contact. Forms mild hazardous reaction with many materials.
7.3 **Stability During Transport:** Normally stable.
7.4 **Neutralizing Agents for Acids and Caustics.** Cautious dilution with water with precaution against violent spattering. Diluted acid may be neutralized with lime or soda ash.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
24 ppm 24 hr bluegill lethal fresh water
42 ppm 48 hr grass EC cat salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
Industrial Chemical Division
Morristown, N.J. 07960
2. Monsanto Co
Monsanto Industrial Chemicals Co
800 N. Lindbergh Blvd
St. Louis, Mo. 63166
3. Stauffer Chemical Co
Industrial Chemicals Division
299 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 20% [illegible] sulfuric acid to 65% [illegible] sulfuric acid
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

XOP

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 15 C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

OXA — OXALIC ACID

Common Synonyms
Ethanedioic acid

Solid crystals | White | Odorless

Sinks and mixes with water

Fire

Not flammable
Poisonous gases are produced in fire

Exposure

ALL FOR SHORT TERM

DUST
Will burn eyes, nose and throat
If inhaled will cause difficult breathing

SOLID
Will burn skin and eyes
If swallowed will cause nausea or loss of consciousness

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook (CG-446-1)

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Ethanedioic acid
3.2 Coast Guard Compatibility Classification: Not applicable
3.3 Chemical Formula: $C_2H_2O_4$
3.4 IMCO United Nations Numerical Designation: Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: White
4.3 Odor: Odorless

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective clothing, gloves, goggles or face shield, and respirator should be worn when handling this material.

5.2 Symptoms Following Exposure: Vapor or dust irritating to eyes, nose and throat. Inhalation of dust may cause difficult breathing. Ingestion may cause nausea or loss of consciousness.

5.3 Treatment for Exposure: Get medical attention. INHALATION: Remove victim to fresh air. Give artificial respiration if not breathing. Keep victim warm and quiet. INGESTION: Induce vomiting by giving large amounts of water. Never give anything by mouth to an unconscious person. Get medical attention. NOTE TO PHYSICIAN: EYES AND SKIN: Flush with plenty of water for at least 15 minutes.

5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent
5.5 Short-Term Inhalation Limits: Not pertinent
5.6 Toxicity by Ingestion: Grade 1 LD50 Not determined
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Not pertinent
5.9 Liquid or Solid Irritant Characteristics: Not pertinent. Dust and solutions irritating to eyes, nose and throat.
5.10 Odor Threshold: Not pertinent

6 FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Generates poisonous gases
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Not flammable
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not flammable

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: Not reactive
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Dilute soda ash
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: 4880 mg/l 24 hr bioassay Bluegill freshwater
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 14% 5 days
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
Industrial Chemicals Division
Morristown, NJ 07960

2. Mallinckrodt Chemical Works
Industrial Chemicals Division
2 and Mallinckrodt Sts
St Louis, MO 63160

Pfizer Inc
Chemical Division
235 E 42 St
New York, NY 10017

10 SHIPPING INFORMATION

10.1 Grades or Purity: Technical 99.6% min
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: None required
10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG-446-2)

SS

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Corrosive Material
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications:

Category	Classification*
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	0

*Extracted from 49 CFR 174.504

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 126.07
13.3 Boiling Point at 1 atm: Decomposes
13.4 Freezing Point: 214°F = 101°C = 374°K
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 1.90 at 5°C (solid)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

NOTES

REVISED 1978

OXY — OXYGEN, LIQUEFIED

Common Synonyms
Liquid oxygen
LOX

Liquefied gas | Light blue | Odorless

Sinks and boils in water

[redacted]

Fire

Not flammable
Containers may explode in fire

Exposure

VAPOR
If inhaled will cause dizziness or difficult breathing

LIQUID
Will cause frostbite

Water Pollution

Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Protect ass[illegible]

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Liquid oxygen LOX
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula.** O_2
3.4 **IMCO/United Nations Numerical Designation.** 1072

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquefied gas
4.2 **Color:** Light blue
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety goggles or face shield or splash glasses; long sleeves; gloves worn outside pants or vent flap down to shoe; short spats; liquid
5.2 **Symptoms Following Exposure:** Inhalation of oxygen can cause nausea, dizziness, irritation, lungs, pulmonary edema, pneumonia, collapse, liquid may cause [illegible] eyes and skin
5.3 **Treatment for Exposure:** INHALATION: Assure the victim adequate ventilation; if respiration is irregular or stopped, give artificial respiration; if breathing is difficult, oxygen by trained personnel only; keep victim warm and quiet; medical attention should be obtained immediately. EYES: Immediately flush eyes with plenty of water for at least 15 minutes, then get medical attention. SKIN: Flush with plenty of water; if frostbite occurs, get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** Not pertinent
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but supports combustion
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Increases intensity of any fire. Mixtures of liquid oxygen and any fuel are highly explosive
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with water will vigorously vaporize, releasing oxygen
7.2 **Reactivity with Common Materials.** Avoid organic and combustible materials such as wood, grease, coal dust, etc. Ignited such mixtures can explode. The low temperature may cause brittleness in some materials
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None
8.2 **Waterfowl Toxicity:** None
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
Linde Division
Morristown, N.J. 07960
2. Airco, Inc.
Industrial Gases Division
575 Mountain Avenue
Murray Hill, N.J. 07974
3. Liquid Air Inc.
Embarcadero Center
San Francisco, Calif. 94111

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.5%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

A1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Nonflammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

OX

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight.** 32.0
13.3 **Boiling Point at 1 atm:**
−297°F = −182.9°C = 90.3°K
13.4 **Freezing Point:**
−361°F = −218°C = 55°K
13.5 **Critical Temperature:**
−180°F = −118°C = 155°K
13.6 **Critical Pressure:**
730 psia = 50 atm = 5.0 MN/m²
13.7 **Specific Gravity:** 1.14 at −183°C (liquid)
13.8 **Liquid Surface Tension.**
13.4 dynes/cm = 0.0134 N/m at −183°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 1.1
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.40
13.12 **Latent Heat of Vaporization:** 91.6 Btu/lb = 50 cal/g = 2.13 × 10³ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5A

NOTES

PFA	# PARAFORMALDEHYDE

Common Synonyms
Polyformaldehyde
Polyoxymethylene
Formaldehyde polymer

Solid powder | White | Irritating odor

Sinks and mixes with water

Fire

Combustible

Exposure

DUST
Irritating to eyes, nose and throat
Harmful if inhaled

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Dispose and flush

2. LABELS

No Para Label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Formaldehyde polymer
Polyformaldehyde
Polyoxymethylene
Polyoxymethylene glycol

3.2 **Coast Guard Compatibility Classification:** Aldehyde

3.3 **Chemical Formula:** $HOCH_2OH$

3.4 **IMCO United Nations Numerical Designation:** 9.0

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Pungent and irritating like formaldehyde

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, protective clothing

5.2 **Symptoms Following Exposure:** Vapors may irritate eyes, mucous membranes and skin, may cause dermatitis. Ingestion may cause irritation of mouth, throat and stomach and may cause death

5.3 **Treatment for Exposure:** INGESTION: give milk or white of egg, then water, induce vomiting. SKIN OR EYES: wash with copious amounts of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 LD$_{50}$ (rat) 800 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors moderately irritating, but have not been known to cause damage after short exposure

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 199°F (approx 93°C) (90°F (approx 32°C))

6.2 **Flammable Limits in Air:** Formaldehyde gas 7 to 73 vol %

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Data not available

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Changes to formaldehyde gas which is highly flammable

6.7 **Ignition Temperature:** 572°F (300°C)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms water solution of formaldehyde

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable, decomposes to formaldehyde gas

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 32 ppm 24 hr catfish TL$_m$, fresh water (100-300 ppm 48 hr flagfish TL$_m$, salt water)

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD,** 37% 5 days (theor. 64% 5 days)

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Celanese Corp
Celanese Chemical Co. Division
245 Park Ave
New York, N.Y. 10017

2. Mallinckrodt Chemical Works
2nd and Mallinckrodt St
St. Louis, Mo. 63160

3. Tennessee Chemicals Inc
Tennessee Intermediates Division
1 Turner Place
Piscataway, N.J. 08854

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 91-99% powder and flake

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

RRC

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** (n=2 to 100)

13.3 **Boiling Point at 1 atm.** Decomposes

13.4 **Freezing Point:** 120 to 342 F (49 to 172 C = 322 to 445 K)

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** 1.42 at 4°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** (solid) -6.45 x 10^3 Btu/lb, -3.58 x 10^3 cal/g, -14.98 x 10^6 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (100 Hg) 25 cal/g, 45 Btu/lb, 0.1 kg

13.16 **Heat of Polymerization.** Not pertinent

(Continued on page 7-xx)

NOTES

PTO PARATHION, LIQUID

Common Synonyms
Ethyl parathion
Phosphorothioic acid, O,O-diethyl O-p-nitrophenyl ester
O,O-Diethyl O-p-nitrophenyl phosphorothioate
O,O-diethyl O-p-nitrophenyl thiophosphate

Liquid — Light to dark brown

Sinks in water. Freezing point is 43°F.

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** O,O-Diethyl O-p-nitrophenyl thiophosphate; O,O-Diethyl O-p-nitrophenyl monothiophosphate; Ethyl Parathion; Phosphorothioic acid, O,O-diethyl O-p-nitrophenyl ester

3.2 **Coast Guard Compatibility Classification**

3.3 **Chemical Formula:** $C_{10}H_{14}NO_5PS$

3.4 **IMCO/United Nations Numerical Designation:**

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Dark to light brown

4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Neoprene coated gloves; aprons; boots; coveralls; and rubber gloves; goggles; respirator or mask approved for toxic dusts and organic vapors.

5.2 **Symptoms Following Exposure:** Inhalation, ingestion, and absorption through the skin cause effects such as impaired vision, contraction of the pupils, headache and tightness of the chest. Nausea, vomiting, abdominal cramps, diarrhea, muscular twitchings, convulsions and possible death may follow. Acute exposure may also be fatal to certain animals which would cause pulmonary edema. Chronic exposure causes cholinesterase inhibition.

5.3 **Treatment for Exposure:** Call a doctor in all cases of exposure. IMMEDIATELY remove victim from exposure, immediately take pulse, respiration, temperature and blood pressure. Give 2 PAM tablets and proceed by physician. EYES: flush with water immediately after contact for at least 5 min. SKIN: remove all clothing and shoes immediately; quickly wipe off the affected area with cotton, cloth, rubber or rubberized gloves; drench the area with water. Do not use soap. Wash the affected area separately with soap and water. INGESTION: Induce vomiting immediately and repeat until vomit fluid is clear. Have victim drink plenty of water. Have victim lie down and keep quiet.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³

5.5 **Short-Term Inhalation Limits.** 0.3 mg/m³ for 30 min

5.6 **Toxicity by Ingestion:** Grade 4; LD_{50} 2 mg/kg rats

5.7 **Late Toxicity:** Both brain and spinal cord damage

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

(continued on page 4)

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Water or alcohol foam

6.4 **Fire Extinguishing Agents Not to be Used:** High pressure water jets may scatter parathion or be ineffective; may be hazardous in confined areas

6.5 **Special Hazards of Combustion Products.** Fumes from decomposing material may contain oxides of sulfur and nitrogen

6.6 **Behavior in Fire:** Containers may explode when heated

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

*7.1 **Reactivity with Water.** Slow reaction; not considered hazardous

*7.2 **Reactivity with Common Materials.** Not reactive

*7.3 **Stability During Transport:** Stable

*7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

*7.5 **Polymerization.** Not pertinent

*7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 4 ppm/96 hr minnow TLm; 0.65 ppm/24 hr/brook trout/running water/static water

8.2 **Waterfowl Toxicity:** LD[illegible] mg/kg

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** Not biodegradable; food chain

9 SELECTED MANUFACTURERS

[illegible] Chemical Plastics Company, Agricultural Division, 600 North Lindbergh Boulevard, St. Louis, Missouri

[illegible] Stauffer Chemical Co., Agricultural Chemical Division, Westport, Connecticut

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 99.5%
Some mixes distributed as wettable powders

10.2 **Storage Temperature:** Ambient

*10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

5.0.X.1

12 HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations.**
Poisonous Class B

*12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

*12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 291.3

*13.3 **Boiling Point at 1 atm:** Very high; decomposes

*13.4 **Freezing Point:** 43.1°F or 6.2°C or 279.4°K

*13.5 **Critical Temperature:** Not pertinent

*13.6 **Critical Pressure:** Not pertinent

*13.7 **Specific Gravity:** 1.269 at 25°C (liquid)

*13.8 **Liquid Surface Tension:** Data not available

*13.9 **Liquid-Water Interfacial Tension.** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

*13.12 **Latent Heat of Vaporization.** Not pertinent

*13.13 **Heat of Combustion** [illegible] Btu/lb [illegible] Btu/gal

*13.14 **Heat of Decomposition.** Not pertinent

*13.15 **Heat of Solution:** Not pertinent

*13.16 **Heat of Polymerization.** Not pertinent

(continued on page 4)

5 HEALTH HAZARDS (Cont'd.)

5.10 **Odor Threshold:** [illegible] ppm

PTB — PENTABORANE

Common Synonyms

(9) Pentaborane nonahydride

Liquid | Colorless | Strong sour milk odor

Ignites when exposed to air. Floats on water

Fire

IGNITES WHEN EXPOSED TO AIR

Exposure

HAZARD IS FROM PRODUCTS OF COMBUSTION

VAPOR

POISONOUS IF INHALED

LIQUID

POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Irritating to eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown.

May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-1

Issue warning. High flammability.

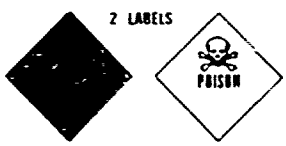
Keep out of water.

Restrict access.

Evacuate area.

Disperse and flush.

2 LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** (9) Pentaborane nonahydride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** B_5H_9

3.4 **IMCO/United Nations Numerical Designation:** 2.2 Gas

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic, sickly pungent, sour milk odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus; chemical goggles; acid-resistant rubber gloves and protective clothing.

5.2 **Symptoms Following Exposure:** Inhalation of vapor may cause dizziness, nausea, headache, convulsions, higher concentrations also cause irritation of the respiratory tract, lung damage, pulmonary edema, shortness of breath, difficult breathing, pain beneath the sternum, tightness of chest, cyanosis, unconsciousness, and coma. Liquid may cause irritation, pain, and redness of the eyes. Contact with skin causes irritation, redness and burning. Can be absorbed through the skin. Symptoms may be delayed because of the anesthetic properties of the material.

5.3 **Treatment for Exposure:** Get medical attention following any exposure. Give oxygen. INHALATION: remove victim to fresh air and if not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. EYES: wash with copious quantities of water for at least 15 minutes. Hold eyes lids apart to wash thoroughly. SKIN: wash immediately with soap and water. Remove affected area with a 5% ammonia solution followed by additional flushing with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.005 ppm

5.5 **Short-Term Inhalation Limits:** 2 ppm for 8 hr; 2 ppm for 1 hr; 2 ppm for 30 min; 2 ppm for 10 min

5.6 **Toxicity by Ingestion:** Grade 4. Dangerous

5.7 **Late Toxicity:** Data not available

Continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Preferably dry chemical and/or fire-fighting foam; or agent suitable for surrounding fire

6.4 **Fire Extinguishing Agents Not to be Used:** Halogenated hydrocarbons

6.5 **Special Hazards of Combustion Products:** Toxic fumes may be formed

6.6 **Behavior in Fire:** Tends to explode; reacts with water; upon contact with water upon adjacent fires produces flammable and toxic gas

6.7 **Ignition Temperature:** Spontaneously flammable; ignites upon exposure to air at ambient temperature

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with water to form flammable and toxic gas. Reaction with hazardous amounts of water unless initiated

7.2 **Reactivity with Common Materials:** Corrosive to rubber, plastics, other synthetics; attacks some greases and some lubricants

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Callery Chemical Company

Callery, Pennsylvania

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical grade; High Purity grade

10.2 **Storage Temperature:** Ambient temperature

10.3 **Inert Atmosphere:** Inert with dry nitrogen

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NOTEW

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Hazard	
Liquid or Solid Hazard	
Poisons	4
Water Pollution	
Human Hazard	4
Aquatic Toxicity	
Aesthetics	
Reactivity	
With Chemicals	4
With Water	
Self-Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	4
Reactivity (Yellow)	4

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Liquid

13.2 **Molecular Weight:** 63.2

13.3 **Boiling Point at 1 atm.:** 58°C (136.4°F) (331.2°K)

13.4 **Freezing Point:** -46.8°C (-52.2°F) (226.4°K)

13.5 **Critical Temperature:** 187°C (368.6°F) (460.2°K)

13.6 **Critical Pressure:** 37.8 atm (555.4 psia)

13.7 **Specific Gravity:** 0.61 at 15°C (liquid)

13.8 **Liquid Surface Tension:** 20.6 dynes/cm = 0.0206 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.2

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.09

13.12 **Latent Heat of Vaporization:** 210 Btu/lb = 117 cal/g = 4.9 kJ/g

13.13 **Heat of Combustion:** -31,000 Btu/lb = -17,200 cal/g = -720 kJ/g

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4

5 HEALTH HAZARDS (Cont'd)

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 0.5 ppm

PCP — PENTACHLOROPHENOL

Common Synonyms
Dowicide 7
Penta
Santophen 20

Solid beads or flakes White to light brown

Sinks in water

Avoid contact with solid and dust Keep people away
Wear goggles and self-contained breathing apparatus
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control officials

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED
Will burn skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS have victim drink water or milk and have vomiting induced
if SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting and get victim to hospital ASAP

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Issue warning - poison
Restrict access
Should be removed

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Dowicide 7
Penta
Santophen 20

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula** C_6ClOH

3 4 **IMCO/United Nations Numerical Designation.** 6 1 2020

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color** Colorless to light brown

4 3 **Odor** Very weak

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Respirator for dust, goggles, protective clothing

5 2 **Symptoms Following Exposure** Dust or vapor irritates skin and mucous membranes causing coughing and sneezing Ingestion causes loss of appetite, nausea, respiratory difficulties, anesthesia, sweating, vomiting Overexposure can cause death

5 3 **Treatment for Exposure** Call a doctor INGESTION induce vomiting if conscious EYES wash with water for 15-30 min SKIN wash well with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.5 mg/m

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Grade 3 LD_{50} 50 to 500 mg/kg (rat)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics** Causes smarting of the skin and light reddening on brief exposure, may cause second-degree burns on long exposure

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.** Gives off toxic and irritating vapors

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 5 ppm 48-hr trout lethal fresh water

8 2 **Waterfowl Toxicity** 4500 ppm/1 LC_{50}/mallards

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640

2 Reichold Chemicals Inc
RCI Bldg
White Plains, N Y 10602

3 Sanford Chemical Co
Port Neches, Tex 77651

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 86-100%

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (blue)	3
Flammability (red)	0
Reactivity (yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight:** 266.35

13 3 **Boiling Point at 1 atm:** 590 F = 310 C = 583 K

13 4 **Freezing Point:** 370 F = 188°C = 461 K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 1.98 at 15 C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5-PCP-A

NOTES

REVISED 1978

PDC

PENTADECANOL

Common Synonyms

Liquid | Colorless | Faint alcohol odor

Floats on water

[illegible]

Fire

Combustible
Extinguish with foam, dry chemical or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids apart and flush with plenty of water

Water Pollution

Harmful to fish and water fowl
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and pollution control officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 1-Pentadecanol
Pentadecyl alcohol

3 2 **Coast Guard Compatibility Classification**
Alcohol

3 3 **Chemical Formula:** $CH_3(CH_2)_{13}CH_2OH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Weak alcoholic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield

5 2 **Symptoms Following Exposure.** Low toxicity. Excessive exposure produces some central nervous system depression. Prolonged contact produces skin irritation.

5 3 **Treatment for Exposure:** INHALATION if necessary, support respiration. INGESTION induce vomiting and call a doctor. SKIN OR EYES wash with copious amounts of water.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity.** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Data not available

6 2 **Flammable Limits in Air.** Data not available

6 3 **Fire Extinguishing Agents.** Foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature.** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

No bulk shipments

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 228.42

13 3 **Boiling Point at 1 atm**
572°F = 300°C = 573°K

13 4 **Freezing Point**
111°F = 44°C = 317°K

13 5 **Critical Temperature**
824°F = 440°C = 713°K

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 0.829 at 50°C (liquid)

13 8 **Liquid Surface Tension**
(est.) 25 dynes/cm = 0.025 N/m at 50°C

13 9 **Liquid-Water Interfacial Tension.**
(est.) 35 dynes/cm = 0.035 N/m at 50°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.024

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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PET	PENTAERYTHRITOL

Common Synonyms	Solid	white	Odorless
2,2-Bis(hydroxymethyl)-1,3-propanediol Pentaerythrite Tetrahydroxymethylmethane Monopentaerythritol Penta	Sinks and mixes slowly with water		

Fire	Combustible
Exposure	VAPOR OR DUST Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Method Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Mono PE, PE, Pentaerythrite, Pentek, Tetrahydroxymethylmethane, Tetrakis(hydroxymethyl)methane, Tetramethylolmethane

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula** $C(CH_2OH)_4$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color** White

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust mask, goggles

5 2 **Symptoms Following Exposure:** Non-toxic, no symptoms likely

5 3 **Treatment for Exposure** None needed

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent (Inert particulates)

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion.** Grade 0 (LD$_{50}$ > 15 g/kg)

5 7 **Late Toxicity** None

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents** water, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature** 842°F (dust cloud)

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Celanese Chemical Company
245 Park Avenue
New York, N.Y. 10017

2 Commercial Solvents Corporation
Terre Haute, Ind. 47808

3 Hercules Incorporated
Coatings & Specialty Products Department
910 Market Street
Wilmington, Del. 19899

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 86–90% plus 10–14% dimer; Pure 98+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 136.2

13 3 **Boiling Point at 1 atm** Not pertinent (sublimes)

13 4 **Freezing Point:** 502°F = 261°C = 534°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.39 at 25°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** −8,730 Btu/lb = −4,850 cal/g = −203 × 10^3 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

PTA	PENTANE

Common Synonyms	Liquid Colorless Gasoline odor Floats on water Flammable vapor is produced Boiling point is 97°F
Fire	FLAMMABLE Flashback along vapor trail may occur Containers may explode when heated Vapor may explode if ignited in an enclosed area
Exposure	VAPOR If inhaled, will cause dizziness or difficult breathing LIQUID Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHAPGE

(See Response Methods Handbook CG 446 4)

Issue warning, high flammability
Restrict access
Evacuate area

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms

3 2 **Coast Guard Compatibility Classification**
Paraffin

3 3 **Chemical Formula** C_5H_{12}

3 4 **IMCO/United Nations Numerical Designation:** 3 1 1265

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield (as vapor or liquid)

5 2 **Symptoms Following Exposure:** Low toxicity. Very high vapor concentrations produce narcosis; aspiration into lungs can produce chemical pneumonitis and pulmonary edema

5 3 **Treatment for Exposure:** INHALATION: remove from exposure, support respiration as needed. INGESTION: do NOT induce vomiting; call physician

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 600 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor is irritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically nonirritating to skin

5 10 **Odor Threshold.** 10 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** −57 [illegible] C

6 2 **Flammable Limits in Air**
1.4 [illegible] (by vol.)

6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Containers may explode

6 7 **Ignition Temperature:** 544 F

6 8 **Electrical Hazard:** Class I, Group D

6 9 **Burning Rate:** [illegible] mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.**
>60ppm [illegible] to kill fish in 96 hours
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Ashland Oil Inc
Petrochemicals Dept
Columbus Ohio 43216

2 Marathon Oil Co
539 South Main St
Findlay Ohio 45840

3 Phillips Petroleum Co
Bartlesville Okla 74004

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure (99.2 %)
Technical research (95 %)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting:** Open flame arrester or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

A I E A W

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	0
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

*12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 72.15

13 3 **Boiling Point at 1 atm**
97.0 F = 36.1 C = 309 K

13 4 **Freezing Point**
-201.0 F = -129.4 C = 143.8 K

*13 5 **Critical Temperature**
385.7 F = 196.5 C = 469.7 K

*13 6 **Critical Pressure:**
4.9 atm = 74.1 psia = 3.4 MN

13 7 **Specific Gravity:** 0.626 at 20 C (liquid)

13 8 **Liquid Surface Tension**
Relation: σ = 0.05 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension:**
50.2 dynes/cm = 0.0502 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 2.5

13 11 **Ratio of Specific Heats of Vapor (Gas).**
1.075

13 12 **Latent Heat of Vaporization.**
154 Btu/lb = 86 cal/g
= 3.59 × 10 J/kg

13 13 **Heat of Combustion** = 19,592 Btu/lb
= 10,884 cal/g = 45.60 × 10 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next sheet

NOTES

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PTE 1-PENTENE

Common synonyms
alpha Amylene
Propylethylene

Liquid | Colorless | Gasoline odor

Floats on water | Flammable vapor is produced | Boiling point is 86°F

Exposure

VAPOR
If inhaled will cause dizziness

LIQUID
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate as

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** alpha n Amylene
Propylethylene

3 2 **Coast Guard Compatibility Classification:** Olefin

3 3 **Chemical Formula:** $CH_3CH_2CH=CH_2$

3 4 **IMCO United Nations Numerical Designation.** 3 1 1108

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color** Colorless

4 3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield (as for gasoline)

5 2 **Symptoms Following Exposure:** Acts as a simple asphyxiant or weak anesthetic at high vapor concentrations Similar to effects caused by gasoline vapors

5 3 **Treatment for Exposure** INHALATION remove victim from exposure SKIN wash with soap and water EYES flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Not irritating

5 9 **Liquid or Solid Irritant Characteristics:** Not irritating

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** -60°F CC -0 F OC

6 2 **Flammable Limits in Air** 1 8 %

6 3 **Fire Extinguishing Agents.** Foam dry chemical or carbon dioxide Stop flow of vapor

6 4 **Fire Extinguishing Agents Not to Be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Containers may explode in fire

6 7 **Ignition Temperature** 527 F

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate** 9 1 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 695 ppm (for sunfish) lethal fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** 0% (theor 3 5 days 0% (theor) 1 day

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston Tex 77001

2 Phillips Petroleum
Bartlesville Okla 74004

3 Texaco Inc
135 E 42 St
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Research 99 9 pure 99 4 technical 97 0%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open flame arrester or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

A I I V W

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight** 70 13

13 3 **Boiling Point at 1 atm** 85 9 F = 29 9 C = 303 K

13 4 **Freezing Point:** -265 F = -165 C = 108 K

13 5 **Critical Temperature.** 376 9 F = 191 C = 464 K

13 6 **Critical Pressure:** 585 psia = 40 atm = 4 05 MN/m²

13 7 **Specific Gravity:** 0 641 at 20 C (liquid)

13 8 **Liquid Surface Tension** 16 5 dynes/cm = 0 0165 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension:** (est) 50 dynes/cm = 0 05 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity:** 2 4

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 053

13 12 **Latent Heat of Vaporization:** 154 6 Btu/lb = 85 87 cal/g = 3 595 × 10³ J/kg

13 13 **Heat of Combustion:** -19 350 Btu/lb = -10 750 cal/g = -450 20 × 10³ J/kg

13 14 **Heat of Decomposition** No pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

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PAA — PERACETIC ACID

Common Synonyms
Peroxyacetic acid
Acetyl hydroperoxide

Liquid | Colorless | Strong odor

Mixes with water. Flammable. Irritating vapor is produced.

Fire

Combustible.
May cause fire on contact with combustibles.
Containers may explode in fire.

Exposure

VAPOR
Irritating to eyes, nose and throat.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning. Oxidizing material.
Avoid contamination of water.
Restrict access.
Disperse and flush.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetyl hydroperoxide
Peroxyacetic acid

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:**
CH_3COOOH CH_3COOH

3.4 **IMCO/United Nations Numerical Designation.** 2.1.1932

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color.** Colorless

4.3 **Odor:** Pungent, acrid.

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Self-contained breathing apparatus. Full protective clothing, goggles, rubber gloves, etc.

5.2 **Symptoms Following Exposure.** Inhalation causes severe irritation of nose and throat. Contact with liquid causes severe irritation of eyes and skin. Ingestion also causes distress including burns of mouth and stomach.

5.3 **Treatment for Exposure.** INHALATION: remove victim to fresh air, check breathing, apply artificial respiration and oxygen if indicated. EYES: flush with water for at least 15 min. call doctor. SKIN: flush with water and treat burns. INGESTION: give plenty of water, call doctor.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion.** Grade I and II: Fatal dosage is a teaspoonful or more.

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold.** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point.** 104°F C.C.

6.2 **Flammable Limits in Air.** Data not available

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire.** Vapors are flammable and explosive. Liquid will detonate if concentration is above 56% because of evaporation of acetic acid.

6.7 **Ignition Temperature.** 392°F

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May cause fire in contact with organic matter, also as an oxidizer. Corrosive to iron, metal including aluminum.

7.3 **Stability During Transport.** Stable. If peroxide and other chemicals, such as metals. At 40°C concentration decreases about 1% each month.

7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water.

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. FMC Corporation
Industrial Chemical Division
633 Third Avenue
New York, N.Y. 10017

2. High Point Chemical Corp.
638 Taylor Street
High Point, N.C. 27261

3. Pf[illegible] and Bayer, Inc.
[illegible]26 08 Northern Boulevard
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 40% peracetic acid
40% acetic acid, 8% hydrogen peroxide, 32% water. 500 ppm stabilizer.

10.2 **Storage Temperature.** 60°F – 120°F

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting.** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

XPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight.** Not pertinent

*13.3 **Boiling Point at 1 atm.** Not pertinent, mixture

*13.4 **Freezing Point.** Approx. 0°F = -18°C = 255°K

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity.** 1.15 at 15°C (liquid)

13.8 **Liquid Surface Tension.** Data not available

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

*13.10 **Vapor (Gas) Specific Gravity.** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization.** Data not available

13.13 **Heat of Combustion.** Data not available

13.14 **Heat of Decomposition.** Data not available

*13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

*At 1 atm in acetic acid-H2O

(Continued on page 5 and 6)

NOTES

PCL	# PERCHLORIC ACID

Common Synonyms Diotonium perchlorate solution	Liquid	Colorless	Odorless
	Sinks and mixes with water		

Fire

Not flammable
Will increase the intensity of a fire
May cause fire on contact with combustibles
Containers may explode in fire
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning - corrosive, oxidizing material
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diotonium perchlorate solution; Perchloric acid solution
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula** $HClO_4 \cdot H_2O$
3 4 **IMCO/United Nations Numerical Designation** UN 1873 (50 - 72% acid) UN 1802 (less than 50% acid)

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves; face shield or vapor tight chemical type safety goggles; rubber apron; rubber boots or shoes
5 2 **Symptoms Following Exposure:** Inhalation of vapors or mist causes burning sensation, sneezing and throat and lung irritation with coughing; prolonged or excessive exposure could cause vomiting and severe shock. Ingestion causes blistering and burns of mouth and stomach. Contact with eyes or skin causes blistering and burns.
5 3 **Treatment for Exposure:** *Get medical attention as indicating all exposures other than simple and* INHALATION: move to fresh air, give oxygen if necessary. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available.
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable. Not may explode in fire
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Water from protected area
6 4 **Fire Extinguishing Agents Not to be Used**
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire** Above 160°C (320°F) will react with combustible material and increase intensity. Fire Containers may explode
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Contact with most combustible materials may cause fires and explosions. Corrosive to most metals with formation of flammable hydrogen gas which may collect in confined spaces
7 3 **Stability During Transport** Unstable if heated
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water and rinse with dilute sodium bicarbonate or soda ash solution
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1057R
Morristown N J 07960

2 J T Baker Chemical Co
Phillipsburg N J 08865

3 Hooker Chemical Corporation
Industrial Chemicals Division
Niagara Falls N Y 14302

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 60% - 72% solution in water
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 445-3

VP

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Oxidizer
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	0
Reactivity (Yellow)	1
	OX

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 100.46 (anhydrous basis)
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** -170.1°F = -112°C = 161°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.6 - 1.8 at 25°C (liquid)
13 8 **Liquid Surface Tension** Data not available
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition.** Data not available
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

PCM — PERCHLOROMETHYL MERCAPTAN

Common Synonyms

Trichloromethyl sulfur chloride
Thiocarbonyl tetrachloride
Trichloromethyl sulfochloride
Trichloromethane sulfenyl chloride

Liquid | Yellow to orange red | Strong unpleasant odor

Sinks in water. Poisonous vapor is produced.

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED WHEN HEATED.

Exposure

VAPOR
POISONOUS IF INHALED.
Irritating to eyes, nose and throat.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Irritating to eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning: poison, water contaminant, air contaminant.
Restrict access.
Disperse and flush.

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichloromethanesulfenyl chloride, Trichloromethane sulphenyl chloride, Trichloromethyl sulphochloride, Trichloromethylsulfur chloride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CCl_3SCl

3.4 **IMCO/United Nations Numerical Designation:** 1670

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Bright yellow, pale yellow, orange-red

4.3 **Odor:** In vessels unpleasant, strong, unbearable, strongly acrid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic and acid spec. canister mask, self-contained breathing apparatus, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation may cause severe irritation of upper respiratory tract; brief exposure to low concentrations may produce central nervous system depression and lung liver and heart congestion. Severe exposures may be fatal. Contact of liquid with eyes causes immediate excoriation and severe pain. Action of vapors may produce severe corneal damage may result. Liquid also causes severe skin irritation. May be absorbed through skin in quantities sufficient to produce systemic poisoning. Ingestion may cause damage to the membranes of the mouth, throat, and gastro-intestinal tract. Pain and burning of the mouth and throat, nausea, vomiting, cramps and diarrhea may occur. In severe cases, tissue ulceration and central nervous system depression may result.

5.3 **Treatment for Exposure:** Get medical attention at once following all exposures to this compound. INHALATION: remove victim to fresh air, give mouth to mouth resuscitation if needed. EYES: flush with water for 15 min. physician's aid if available. If skin is affected, flush with water. INGESTION: give large amounts of water, then induce vomiting until vomitus is clear, give milk, eggs, stomach tube.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 75 mg/kg (rats)

5.7 **Late Toxicity:** Data not available

Continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Very irritating vapors formed from hot material. May form toxic phosgene gas, hydrogen chloride and sulfur dioxide.

6.6 **Behavior in Fire:** At elevated temperatures will decompose to carbon tetrachloride, sulfur chloride and heavy oily polymer.

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts only when hot to give carbon dioxide, hydrochloric acid and sulfur

7.2 **Reactivity with Common Materials:** Reacts with iron or steel, evolving carbon tetrachloride. Corrosive to most metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with dilute sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Stauffer Chemical Co.
1200 South 47th Street
Richmond, Calif. 94804

2. Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

3. Pfaltz and Bauer, Inc.
172nd Street and Northern Boulevard
Flushing, N.Y. 11358

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 95%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NOX

12 HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Poisonous Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 185.9

13.3 **Boiling Point at 1 atm:** 300°F = 149°C = 422°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.70 at 15°C (liquid)

13.8 **Liquid Surface Tension:** 35.02 dynes/cm = 0.03502 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = 52 cal/g = 2.2 × 10⁵ J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4

5 HEALTH HAZARDS (Cont'd)

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

PTL PETROLATUM

Common Synonyms Petroleum gel	Thick liquid Dark brown green amber or white Odorless Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-444.4

Mechanical containment
Should be recovered
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Petrolatum
Petroleum gels
Vaseline
Vaseline petrolatum

3.2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHAPACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless amber green dark brown

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles rubber gloves

5.2 **Symptoms Following Exposure:** None

5.3 **Treatment for Exposure:** EYES Wash with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** No pertinent data

5.5 **Short-Term Inhalation Limits.** No pertinent data

5.6 **Toxicity by Ingestion:** Grade 1 Data for Vaseline

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** None

5.9 **Liquid or Solid Irritant Characteristics.** None

5.10 **Odor Threshold:** No pertinent data

6 FIRE HAZARDS

6.1 **Flash Point.** (cc) 410 F C.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents.** Water foam dry chemical carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** No pertinent

7.5 **Polymerization** No pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTUREKS

Mobil Oil Corp.
South American Distributor
Penreco, N.J. Source

Penreco
Bryan Petroleum

Quaker State Oil Refining Co.
Oil City, Pa. Source

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** USP NF (Official white and yellow petrolatum)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-444.3

ATI

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Crystalline

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm.** Not applicable

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure** Not pertinent

*13.7 **Specific Gravity:** (est.) 0.865 at 60°C (liquid)

13.8 **Liquid Surface Tension.** Data not available

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not applicable

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution** Not pertinent

*13.16 **Heat of Polymerization:** Not pertinent

NOTES

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PTN	PETROLEUM NAPHTHA

Common Synonyms
Petroleum spirit

Liquid | Colorless | Gasoline odor

Floats on water. Flammable vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Not irritating to eyes, nose or throat.

LIQUID
Harmful if swallowed.

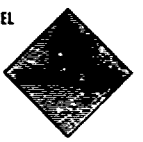
Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-448-4

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation**

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:**
4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment**
5.2 **Symptoms Following Exposure:** INHALATION
5.3 **Treatment for Exposure:** INHALATION
INGESTION
EYES
SKIN
5.4 **Toxicity by Inhalation (Threshold Limit Value)**
5.5 **Short-Term Inhalation Limits**
5.6 **Toxicity by Ingestion.**
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.**
5.9 **Liquid or Solid Irritant Characteristics.**
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:**
6.2 **Flammable Limits in Air:**
6.3 **Fire Extinguishing Agents:** Foam
carbon dioxide, dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water or water-containing agents
6.5 **Special Hazards of Combustion Products.** None known
6.6 **Behavior in Fire** None known
6.7 **Ignition Temperature:**
6.8 **Electrical Hazard** None known
6.9 **Burning Rate**

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** None known
7.2 **Reactivity with Common Materials:** None known
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics** None known
7.5 **Polymerization** None known
7.6 **Inhibitor of Polymerization** None known

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Arabian Refining Co.
ARCO Chemical Co., Division
260 S. Broad St.
Philadelphia, Pa. 19101

Shell Oil Co.
Kansas City, Mo. 64114

Exxon Co., U.S.A.
Attn: Division
1800 Meachan Rd.
Pasadena, Texas

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

V E I V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation** No rating
12.3 **NFPA Hazard Classification:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid
*13.2 **Molecular Weight:** Not applicable
*13.3 **Boiling Point at 1 atm.**
Not applicable
13.4 **Freezing Point.** Not applicable
13.5 **Critical Temperature:** Not applicable
13.6 **Critical Pressure:** Not applicable
*13.7 **Specific Gravity:**
13.8 **Liquid Surface Tension:**
Not applicable
*13.9 **Liquid-Water Interfacial Tension**
Not applicable
*13.10 **Vapor (Gas) Specific Gravity**
Not applicable
13.11 **Ratio of Specific Heats of Vapor (Gas).**
1.08
*13.12 **Latent Heat of Vaporization:**
Not applicable
*13.13 **Heat of Combustion**
Data not available
13.14 **Heat of Decomposition:** Not applicable
13.15 **Heat of Solution:** Not applicable
13.16 **Heat of Polymerization:** Not applicable

(Continued on page 4)

NOTES

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PHN	PHENOL

Common Synonyms
Carbolic Acid
Hydroxybenzene

Solid crystals or waxy lump
White solid or light tan liquid
Sweet tarry odor

May float or sink and mixes slowly with water

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

LIQUID OR SOLID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intake

1 RESPONSE TO DISCHARGE

See Hazardous Materials Handbook, Section 4

E
R
Sh
Ev

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Carbolic acid
Hydroxybenzene
Phenic acid
Phenol

3.2 **Coast Guard Compatibility Classification**
Phenol

3.3 **Chemical Formula:** C_6H_5OH

3.4 **IMCO United Nations Numerical Designation.** 1671

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color:** Colorless to pink

4.3 **Odor** Sickening sweet tarry odor detectable at very low concentrations

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing and gloves

5.2 **Symptoms Following Exposure:** Weakness, pallor, and blue skin color; dark urine; and death

5.3 **Treatment for Exposure:** INHALATION: Victim should be moved to fresh air; keep him quiet and warm and administer oxygen if breathing is difficult. Give artificial respiration if breathing has stopped. INGESTION: Do NOT induce vomiting. Give large quantities of water. Immediately transport to hospital. Do not leave victim unattended. EYES: Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention. SKIN: Immediately remove contaminated clothing. Wash skin with soap and water. Get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 5 ppm

5.5 **Short-Term Inhalation Limits:** Data unavailable

5.6 **Toxicity by Ingestion:** Grade 3 LD$_{50}$ 500 mg/kg

5.7 **Late Toxicity:** Carcinogenic in laboratory animals

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation to eyes and respiratory tract. Effects may be delayed.

5.9 **Liquid or Solid Irritant Characteristics:** Causes severe burns. May cause permanent damage if not washed off immediately.

5.10 **Odor Threshold:** 0.05 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 175°F C.C.

6.2 **Flammable Limits in Air.** 1.7% - 8.6%

6.3 **Fire Extinguishing Agents:** Water fog. Foam, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Toxic and irritating vapors are generated when heated.

6.6 **Behavior in Fire:** Vapor flame is explosive when heated which will form explosive mixtures in air.

6.7 **Ignition Temperature:** 1319°F

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 5.26 mg/l 96-hour TLm Fresh water
Approximately 1 ppm Fresh water

8.2 **Waterfowl Toxicity** Data unavailable

8.3 **Biological Oxygen Demand (BOD)**
Zero 5 days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTUREPS

1. Allied Chemical Corp
Fibers Division
Morristown, New Jersey

2. Dow Chemical
Midland, Michigan

3. Monsanto Company
Monsanto Polymer & Petrochemical Co
800 North Lindbergh Blvd
St. Louis, Missouri

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 90%, 95%, USP, Reagent, Technical 82.5% (remainder water)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, Table 4

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Poison liquid, solid Class B

*12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	
Health	
Short Term Hazard	3
Long Term Hazard	*
Poison	*
Water Pollution	
Human Toxicity	*
Aquatic Toxicity	*
Aesthetic	*
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard-Blue	3
Flammability-Red	1
Reactivity-Yellow	0

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:**
Solid

13.2 **Molecular Weight:** 94

*13.3 **Boiling Point at 1 atm:**
359.2°F 181.8°C 455.0°K

*13.4 **Freezing Point:**
107.6°F 42.0°C 315.0°K

*13.5 **Critical Temperature:**
Not available

13.6 **Critical Pressure:**
Not available

*13.7 **Specific Gravity:** 1.071 at 41°C (liquid)

*13.8 **Liquid Surface Tension.**
Not available

13.9 **Liquid-Water Interfacial Tension:**
Not available

*13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.08

13.12 **Latent Heat of Vaporization.**
Not available

*13.13 **Heat of Combustion:** -13,640 Btu/lb
-7,580 cal/g -317.2 kcal/g-mole

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

* Indicates Proposed Values

NOTES

REVISED 1978

FDL	PHENYLDICHLOROARSINE, LIQUID

Common Synonyms

Fenylarsenic dichloride

Liquid | Colorless to yellow | Weak unpleasant odor

Sinks in water

Fire

Fire data not available
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

Isolate hazard area, deny entry
Keep unnecessary people away; stay upwind
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Phenylarsenic dichloride
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $C_6H_5AsCl_2$
3.4 **IMCO/United Nations Numerical Designation:** 1556

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to yellow
4.3 **Odor:** Weak, but very unpleasant

5 HEALTH HAZARDS

5 **Personal Protective Equipment:** Full protective clothing, including self-contained breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation of vapors or mist may cause pain, nausea, vomiting, and edema. Vapor or liquid causes severe burns; eyes and/or eyelids may be severely burned. Liquid may cause severe burns and/or ulceration. Skin burns may be severe and slow to heal.

5.3 **Treatment of Exposure:** Get medical attention immediately following all exposures to this compound. INHALATION: remove victim to fresh air; if not breathing, give artificial respiration; if breathing has ceased, trained personnel may administer oxygen. EYES: immediately wash with large amounts of water for at least 15 min. SKIN: flush with water and wash well with soap and water. Remove contaminated clothing, shoes, and leather goods (e.g., watchbands, belts). INGESTION: if victim is conscious, induce vomiting by touching back of throat with finger or by giving syrup of ipecac. Do not induce vomiting or give anything by mouth to an unconscious person. Call a physician immediately in all cases of exposure.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Data not available
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Not known
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Highly toxic gases are produced when heated
6.6 **Behavior in Fire:** Data not available
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Not known

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to produce toxic and hazardous fumes of HCl and arsenic oxides
7.2 **Reactivity with Common Materials:** Corrodes metals because of HCl fumes
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Stauffer Chemicals Inc
Westport, Connecticut
Ansul Products Division
Marinette, Wisconsin
Berry Metal Co
Kansas City, Kansas

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-3)

4 4 X

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poison, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 222.9
13.3 **Boiling Point at 1 atm:** 569°F = 298°C = 571°K
13.4 **Freezing Point:** 32°F = 0°C = 273°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.67 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 44 dynes/cm = 0.044 N/m at 25°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 98 Btu/lb = 54.5 cal/g = 2.3 × 10⁵ J/kg
13.13 **Heat of Combustion:** -8,450 Btu/lb = -4,690 cal/g = -196.3 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

PHH PHENYLHYDRAZINE HYDROCHLORIDE

Common Synonyms	Solid	White to tan	Weak odor
Phenylhydrazine chloride	Sinks and mixes with water		

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID POISONOUS IF SWALLOWED If swallowed will cause nausea
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

If material is in water:
Contain material
Recover if possible
Dispose of safely

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Phenylhydrazine chloride

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_6H_5NHNH_2 \cdot HCl$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White to tan

4.3 **Odor:** Weak odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, rubber gloves, goggles

5.2 **Symptoms Following Exposure:** Inhalation of dust of material may cause severe irritation of eyes, nose and throat. Phenylhydrazine and its salts are considered dangerous poisons and ingestion of even small amounts may cause severe anemia and liver injury. Contact with eyes may cause severe irritation and possible corneal injury. Contact with skin may cause irritation and dermatitis.

5.3 **Treatment for Exposure:** INHALATION: If victim is not breathing, get medical attention. Post SKIN: Immediately give large amount of water. Remove contaminated clothing, get medical attention if irritation persists. EYES: Flush with water for at least 15 min. Continue flushing and repeat if irritation persists. SKIN: Flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Cancer suspect agent

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water fog, dry chemical, carbon dioxide, foam

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating fumes and oxides of nitrogen and hydrochloride may form in fire

6.6 **Behavior in Fire:** Decomposes with flame and deposits white solid

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May be corrosive to metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Eastman Organic Chemicals
343 State Street
Rochester, N.Y. 14650

Aldrich Chemical Co.
940 W. St. Paul Ave.
Milwaukee, Wis. 53233

Gallard-Schlesinger Chemical Mfg. Co.
584 Mineola Ave.
Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial, Pure

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 144.6

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** See page 2 of this PHH

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.36 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

See page 2 of this PHH

NOTES

PHG	PHOSGENE

Common Synonyms
Carbonyl chloride

Liquefied compressed gas. Colorless gas or light yellow liquid. Sweet or sharp odor.

Liquid sinks in water. Poisonous vapor is produced. Boiling point is 47°F.

Fire

Not flammable.
POISONOUS GASES ARE PRODUCED WHEN HEATED.

Exposure

VAPOR
POISONOUS IF INHALED.
Irritating to eyes, nose and throat.
Effects may be delayed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, 1978.

2 LABEL

POISON GAS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula: $COCl_2$
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Compressed gas
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INHALATION
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

*10.1 Grades of Purity:
*10.2 Storage Temperature:
*10.3 Inert Atmosphere:
*10.4 Venting: Safety relief

11 HAZARD ASSESSMENT CODE

See Response Assessment Handbook, 1978.

A C 1 3 Q

12 HAZARD CLASSIFICATIONS

*12.1 Code of Federal Regulations:
*12.2 NAS Hazard Rating for Bulk Water Transportation:
*12.3 NFPA Hazard Classifications.

Category	Classification
	4

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm:
*13.2 Molecular Weight:
*13.3 Boiling Point at 1 atm:
*13.4 Freezing Point:
*13.5 Critical Temperature:
*13.6 Critical Pressure:
*13.7 Specific Gravity:
*13.8 Liquid Surface Tension:
*13.9 Liquid-Water Interfacial Tension:
*13.10 Vapor (Gas) Specific Gravity:
*13.11 Ratio of Specific Heats of Vapor (G.s):
*13.12 Latent Heat of Vaporization:
*13.13 Heat of Combustion:
*13.14 Heat of Decomposition:
*13.15 Heat of Solution:
*13.16 Heat of Polymerization:

Recommended Label Text

NOTES

REVISED 1978

PAC	# PHOSPHORIC ACID

Common Synonyms Orthophosphoric acid	Thick liquid Colorless Odorless Sinks and mixes with water
Fire	Not flammable Flammable gas is formed on contact with metals
Exposure	LIQUID Will burn skin and eyes If swallowed, will cause nausea, vomiting, or loss of consciousness
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - corrosive
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Orthophosphoric acid
3 2 **Coast Guard Compatibility Classification** Non-oxidizing mineral acid
3 3 **Chemical Formula** H_3PO_4
3 4 **IMCO/United Nations Numerical Designation** 9 0 1805

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield, rubber gloves and protective clothing.
5 2 **Symptoms Following Exposure.** Burns on mouth and lips, sour acrid taste, severe gastrointestinal irritation, nausea, vomiting, bloody diarrhea, difficult swallowing, severe abdominal pains, thirst, tenderness, difficult breathing, convulsions, collapse, shock, death.
5 3 **Treatment for Exposure:** INGESTION: do NOT induce vomiting; give water, milk or vegetable oil; SKIN OR EYE CONTACT: flush with water for at least 15 min.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1.0 mg/m³
5 5 **Short-Term Inhalation Limits:** Not pertinent.
5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 50 to 500 mg/kg
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Not volatile
5 9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant; may cause pain and second degree burns after a few minutes contact.
5 10 **Odor Threshold:** Not pertinent.

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Mild evolution of heat
7 2 **Reactivity with Common Materials:** Reacts with metals to generate flammable hydrogen gas
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, neutralize with lime
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** TLm 100 ppm/24 hr/mosquito fish/Fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 CF Industries Inc
Bartow Phosphate Complex
Bartow, Fla 33830

2 Cities Service Co Inc
North American Chemicals & Metals Group
60 Wall St
New York, N Y 10005

3 Freeport Minerals Co
Freeport Chemical Co Division
161 East 42 St
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** NF food fertilizer commercial all 75-85% the balance being water
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	3
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 98.00
13 3 **Boiling Point at 1 atm:** >266°F = >130°C = >403°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.892 at 25°C (liquid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** -52 Btu/lb = -29 cal/g = 1.2 × 10⁵ J/kg
13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

PPO PHOSPHORUS OXYCHLORIDE

Common Synonyms	Oily liquid Colorless to light yellow Musty odor Fumes in air sinks and reacts with water Poisonous gas is produced Freezing point is 34°F
Fire	Not flammable
[illegible]	VAPOR Irritating to eyes nose or throat Harmful if inhaled LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning - corrosive
Restrict access
Disperse and flush with care

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Phosphoryl chloride
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** $POCl_3$
3 4 **IMCO-United Nations Numerical Designation.** 8 0 1810

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Colorless to pale yellow
4 3 **Odor:** Pungent and musty disagreeable and lingering

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical-safety goggles Face shield self contained or air line respirator hard hat foot protection rubber gloves and clothing
5 2 **Symptoms Following Exposure:** Vapors burn eyes and respiratory tract Liquid is very corrosive to body tissues because of reaction with water to form hydrochloric and phosphoric acids
5 3 **Treatment for Exposure.** *CAUTION persons doing treatment should protect themselves against exposure* INHALATION remove victim from contaminated area at once if breathing has stopped start artificial respiration call a doctor INGESTION give water or milk do NOT induce vomiting SKIN remove contaminated clothing and flush exposed skin surfaces with water EYES retract eyelids and wash with water for at least 15 min call a doctor
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 5 ppm
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion** Grade 3, oral rat LD_{50} = 380 mg/kg
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury Eyes cannot be tolerated even at low concentrations
5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third degree burns on short contact and is very injurious to the eyes
5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air** Not flammable
6 3 **Fire Extinguishing Agents** Sand and carbon dioxide on adjacent fires
6 4 **Fire Extinguishing Agents Not to be Used** Water
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire** Poisonous corrosive irritating gases are generated when heated or when in contact with water
6 7 **Ignition Temperature.** Not flammable
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate.** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Vigorous reaction with evolution of hydrogen chloride fumes
7 2 **Reactivity with Common Materials** Corrosive to most metals except zinc and lead Products of its reaction with water rapidly corrode steel and most metals with formation of flammable hydrogen gas
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Flush with water neutralize acids or mix with lime or soda ash
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 FMC Corp
Organic Chemicals Division
633 Third Ave
New York N Y 10017
2 Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St Louis Mo 63166
3 Stauffer Chemical Co
Specialty Chemical Division
Cold Creek Ala 36542

10 SHIPPING INFORMATION

10 1 **Grades or Purity** 99 99 9+
10 2 **Storage Temperature** Above 35°F
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive material
12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular weight** 153 33
13 3 **Boiling Point at 1 atm**
225°F = 107°C = 380°K
13 4 **Freezing Point** 34°F = 1°C = 274°K
13 5 **Critical Temperature:**
630°F = 332°C = 605°K
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity.** 1 675 at °C (liquid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** (see 11 708)
13 12 **Latent Heat of Vaporization:**
97 Btu/lb = 54 cal/g = 2 3 × 10⁵ J/kg
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on next page)

NOTES

REVISED 1978

PPP

PHOSPHORUS PENTASULFIDE

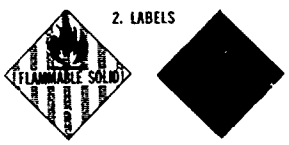
Common Synonyms	Solid flakes or powder. Yellow to green. Odorless or rotten egg odor. Sinks and reacts with water. Poisonous gas is produced.
Fire	FLAMMABLE MAY BE IGNITED BY SPARK, FRICTION OR STATIC DISCHARGE. Containers may explode in fire. POISONOUS IRRITATING GASES ARE PRODUCED IN FIRE.
Exposure	DUST Irritating to eyes, nose and throat. SOLID Irritating to skin and eyes. Harmful if swallowed.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning: high flammability, poison.
Restrict access.
Evacuate area.
Should be removed.

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Phosphoric sulfide; Phosphorus persulfide; Thiophosphoric anhydride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** P_4S_{10}

3.4 **IMCO/United Nations Numerical Designation:** 4.1/1340

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Light greenish yellow; greenish gray

4.3 **Odor:** Like rotten eggs. High (lethal) concentrations can paralyze the sense of smell.

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Chemical safety goggles; plastic gloves; should self-contained or air line respirator.

5.2 **Symptoms Following Exposure.** Hydrogen sulfide gas formed by reaction with moisture can cause death by respiratory failure. The gas also irritates eyes and respiratory system. The solid irritates skin and eyes; the symptoms may be delayed several hours.

5.3 **Treatment for Exposure:** INHALATION: remove victim from contaminated area; if breathing has stopped, begin artificial respiration. INGESTION: induce vomiting; call physician. SKIN: remove contaminated clothing and wash area with large amounts of water. EYES: flush with large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm (hydrogen sulfide)

5.5 **Short-Term Inhalation Limits:** 20 ppm for 5 min (hydrogen sulfide)

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Hydrogen sulfide gas formed by reaction with moisture causes severe irritation of eyes and throat and can cause eye and lung injury; it cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain may cause scarring and reddening of the skin.

5.10 **Odor Threshold:** 0.0047 ppm (hydrogen sulfide). See discussion, par. 4.3.

6 FIRE HAZARDS

6.1 **Flash Point:** Flammable solid.

6.2 **Flammable Limits in Air:** Not pertinent.

6.3 **Fire Extinguishing Agents:** Sand and carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Water.

6.5 **Special Hazards of Combustion Products:** Products of combustion include sulfur dioxide and phosphorus pentoxide, which are irritating to eyes, nose, throat.

6.6 **Behavior in Fire:** Not pertinent.

6.7 **Ignition Temperature:** 527°F (liquid).

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** Not pertinent.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with liquid water or atmospheric moisture to liberate toxic hydrogen sulfide gas.

7.2 **Reactivity with Common Material:** No reaction.

7.3 **Stability During Transport:** Can be ignited by friction.

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD):** Data not available.

8.4 **Food Chain Concentration Potential.** None.

9 SELECTED MANUFACTURERS

1. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

2. Occidental Petroleum Corp.
Hooker Chemical Corp.
Industrial Chemicals Div.
Niagara Falls, N.Y. 14302

3. Stauffer Chemical Co.
Specialty Chemical Division
Morrisville, Pa. 19067

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Regular (technical); reactive; thick reactor; technical distilled; undistilled; all 95%+.

10.2 **Storage Temperature.** Ambient.

10.3 **Inert Atmosphere.** No requirement.

10.4 **Venting:** Sealed containers must be stored in a well-ventilated area.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

RRC

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable solid.

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.

12.3 **NFPA Hazard Classifications.**

Category	Classification*
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	2
	W

*First column refers to non-fire situation.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid.

13.2 **Molecular Weight:** 222.27.

13.3 **Boiling Point at 1 atm.**
959°F = 515°C = 788°K.

13.4 **Freezing Point.** 527°F = 275°C = 548°K.

13.5 **Critical Temperature.** Not pertinent.

13.6 **Critical Pressure.** Not pertinent.

13.7 **Specific Gravity:** 2.03 at 26°C (solid).

13.8 **Liquid Surface Tension.** Not pertinent.

13.9 **Liquid-Water Interfacial Tension.** Not pertinent.

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent.

13.12 **Latent Heat of Vaporization.**
184 Btu/lb = 102 cal/g = 4.27×10^5 J/kg.

13.13 **Heat of Combustion.** −10,900 Btu/lb = −6,050 cal/g = -253×10^5 J/kg.

13.14 **Heat of Decomposition.** Not pertinent.

13.15 **Heat of Solution.** (est.) −20 Btu/lb = −12 cal/g = -0.5×10^5 J/kg.

13.16 **Heat of Polymerization.** Not pertinent.

(Continued on page 5-443)

NOTES

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PPR — PHOSPHORUS, RED

Common Synonyms: Amorphous phosphorus	Solid powder Sinks in water	Reddish brown	Odorless

Fire

FLAMMABLE
POISONOUS IRRITATING AND FLAMMABLE GASES ARE PRODUCED IN FIRE

Exposure

SOLID
Will burn eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Amorphous phosphorus
3 2 **Coast Guard Compatibility Classification.** Phosphorus elemental
3 3 **Chemical Formula:** P
3 4 **IMCO United Nations Numerical Designation:** 4 1 1338

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** Reddish brown
4 3 **Odor:** Odorless

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, gloves of rubber or vinyl, chemical safety glasses, rubber shoes
5 2 **Symptoms Following Exposure:** Physically irritating to eyes, otherwise essentially harmless and not toxic unless contaminated by highly toxic yellow phosphorus as an impurity
5 3 **Treatment for Exposure** EYES: flush thoroughly with water and get medical attention. SKIN: flush with water and wash with soap and water. CAUTION: *Avoid brushing as it can mix gentle material on skin or clothing*
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Nonvolatile
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Flammable solid
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents.** Water
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products:** Heat may cause reversion to yellow phosphorus which is toxic and spontaneously flammable upon contact with air. Burning yields toxic oxides of phosphorus
6 6 **Behavior in Fire.** Refer to 6 5
6 7 **Ignition Temperature:** 30°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** Avoid uncontrolled contact with oxidizing agents (chlorates, nitrates, halogens, etc.) or with strong alkaline hydroxides. Can react violently with oxidizing agent in presence of air and moisture liberating phosphorus acids and toxic, spontaneously flammable phosphine gas
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 0.105 ppm 48 hr bluegill TLm fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 FMC Corp
Inorganic Chemicals Division
633 Third Ave
New York, N Y 10017
2 Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St Louis, Mo 63166
3 Stauffer Chemical Co
Industrial Chemical Division
Mt Pleasant, Tenn 38474

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99.9% Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 123.89
13 3 **Boiling Point at 1 atm:** Catches fire
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.20 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

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PBR PHOSPHORUS TRIBROMIDE

Common Synonyms
Phosphorus bromide

Liquid Colorless to pale yellow Sharp, penetrating odor

Sinks and mixes violently with water

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

LIQUID
Will burn skin and eyes.
If swallowed will cause nausea

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning corrosive air contaminant water contaminant
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Phosphorus bromide
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula** PBr3
3 4 **IMCO/United Nations Numerical Designation** 1808

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless or slightly yellow
4 3 **Odor:** Pungent sharp penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Acid gas canister type mask (full face type for emergency), chemical safety goggles, rubber gloves, clothing and safety shoes all made from rubber
5 2 **Symptoms Following Exposure:** Inhalation causes severe irritation of nose, throat and lungs. Ingestion causes burns of mouth and stomach. Contact with eyes or skin causes severe burns
5 3 **Treatment for Exposure** INHALATION remove victim to clear air, if necessary apply artificial respiration and or administer oxygen INGESTION dilute by drinking water, then neutralize with milk of magnesia, egg white, etc. do not use sodium bicarbonate EYES immediately flush with large amounts of water for at least 15 min SKIN immediately flush with large amounts of water, remove contaminated clothing
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritan. Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires
6 5 **Special Hazards of Combustion Products:** Irritating hydrogen bromide and phosphoric acid vapors may form in fire
6 6 **Behavior in Fire** Acids formed by reaction with water will attack metals and generate flammable hydrogen gas which may form explosive mixtures in enclosed spaces
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently with water evolving hydrogen bromide an irritating and corrosive gas apparent as white fumes
7 2 **Reactivity with Common Materials.** In the presence of moisture, highly corrosive to most metals except lead and nickel
7 3 **Stability During Transport:** Unstable if heated
7 4 **Neutralizing Agents for Acids and Caustics** Flush with water and rinse with dilute aqueous sodium bicarbonate or soda ash
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Michigan Chemical Corp
301 East Ohio St
Chicago Ill 60611
2 White Chemical Corp
East 22 Street
Bayonne N J 07002
3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Purified 99.5%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446)

XO

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Corrosive liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight** 270.73
13 3 **Boiling Point at 1 atm** 441°F = 173°C = 446 K
13 4 **Freezing Point** -42.9°F = -49.5°C = 232.7°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 2.852 at 30°C (liquid)
13 8 **Liquid Surface Tension** 45 dynes/cm = 0.045 N/m at 24°C
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** 6.4 Btu/lb = 35.8 cal/g = 1.50 × 10⁵ J/kg
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** -446 Btu/lb = -248 cal/g = -10.4 × 10⁵ J/kg
13 16 **Heat of Polymerization** Not pertinent

(Continued on next page)

NOTES

PPT

PHOSPHORUS TRICHLORIDE

Common Synonyms

Liquid | Colorless to slightly yellow | Sharp irritating odor

Fumes in air | sinks and reacts with water | Harmful vapor is produced

Fire

Not flammable

Exposure

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled

LIQUID
Will burn skin and eyes
Poisonous if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - corrosive
Restrict access
Disperse and flush with care

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula.** PCl_3

3 4 **IMCO/United Nations Numerical Designation.** NO 1809

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless to slightly yellow

4 3 **Odor:** Pungent, irritating, like HCl and chloric acid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Chemical safety goggles, plastic face shield, self-contained or air line respirator, safety hat, rubber gloves and protective clothing

5 2 **Symptoms Following Exposure:** Vapor causes severe irritation of eyes and respiratory tract. Liquid burns eyes and skin.

5 3 **Treatment for Exposure:** *CAUTION: Persons doing treatment should protect themselves.* INHALATION: remove victim from contaminated area; if breathing has stopped, start artificial respiration; call a doctor. INGESTION: if victim is conscious, give large quantities of water; do NOT induce vomiting; call a doctor. EYES: retract eyelids and wash eye with water for at least 15 min.; call a doctor. SKIN: remove contaminated clothing and wash exposed skin with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 ppm

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 550 mg/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation of eyes and nose and can cause eye and lung injury. Effects cannot be incriminated even at low concentrations.

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is severely injurious to the eyes.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Non-flammable

6 2 **Flammable Limits in Air:** Non-flammable

6 3 **Fire Extinguishing Agents:** Sand, carbon dioxide and dry chemicals on adjacent fires

6 4 **Fire Extinguishing Agents Not to be Used:** Water

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire.** Generates toxic heating gases

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Non-flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently and may cause flashes of fire. Hydrochloric acid fumes are formed in the reaction.

7 2 **Reactivity with Common Materials:** Corrodes most common construction material. Reacts with water to form hydrochloric acid which reacts with most metals to form flammable hydrogen gas.

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water, neutralize acids formed with lime or soda ash.

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available. See 5.6

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. FMC Corp.
Organic Chemicals Division
633 Third Ave.
New York, N.Y. 10017

2. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

3. Stauffer Chemical Co.
Specialty Chemical Division
Cold Creek, Ala. 36512

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure 99.9+%; technical 98.5%

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

YO

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive material

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 137.33

13 3 **Boiling Point at 1 atm:** 169°F = 76°C = 349°K

13 4 **Freezing Point:** −170°F = −112°C = 161°K

13 5 **Critical Temperature.** 547°F = 286°C = 559°K

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 1.574 at 20°C (Liquid)

13 8 **Liquid Surface Tension:** 25.6 dynes/cm = 0.0256 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4.7

13 11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.200

13 12 **Latent Heat of Vaporization** 98 Btu/lb = 54 cal/g = 2.3 × 10³ J/kg

13 13 **Heat of Combustion:** Non-combustible

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

PPW	PHOSPHORUS WHITE

Common synonyms
Yellow phosphorus

Waxy solid | Light yellow | Garlic odor

Fumes and burns in air sinks in water

FLAMMABLE
May ignite on contact with air
POISONOUS IRRITATING GASES ARE PRODUCED IN FIRE

SOLID
Will burn skin and eyes
If swallowed will cause nausea vomiting or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

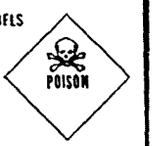
1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning: highly flammable
person
Personnel
Evacuated
Shoreline cleared
Chemical and physical treatment

2. LABELS





3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Yellow phosphorus
3 2 **Coast Guard Compatibility Classification** Phosphorus, elemental
3 3 **Chemical Formula** P
3 4 **IMCO United Nations Numerical Designation.** 4 2 1300

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid or waxy solid
4 2 **Color:** Pale yellow to deep straw
4 3 **Odor:** Distinctive disagreeable pungent sharp garlic-like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Heavy rubber gloves and goggles or face shield
5 2 **Symptoms Following Exposure** Solid or liquid causes severe burns. Can be ingested causes nausea vomiting jaundice low blood pressure coma and death. Symptoms after ingestion may be delayed for 12 hours or longer.
5 3 **Treatment for Exposure:** INGESTION If ingested DO NOT induce vomiting call a doctor at once SKIN OR EYE CONTACT Immediately flush with plenty of water for at least 15 min keep skin clean and wet get medical attention as obtained
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0 1 mg m3
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion** Grade 4 LD50 below 50 mg kg
5 7 **Late Toxicity:** Severe attack of liver and bones
5 8 **Vapor (Gas) Irritant Characteristics.** Nonvolatile
5 9 **Liquid or Solid Irritant Characteristics.** Severe skin burns Causes severe and deep burns by contact and is very much worse than gasoline
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Ignites spontaneously in air
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents** Water
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Fumes from burning phosphorus are highly irritating
6 6 **Behavior in Fire:** Ignites when exposed to air
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** Ignites when exposed to air
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 0 100 ppm 48 hr TLm fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 FMC Corp
Inorganic Chemicals Division
633 Third Ave
New York N Y 10017

2 Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St Louis Mo 63166

3 Stauffer Chemical Co
Industrial Chemical Division
Mt Pleasant Tenn 38474

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 + wt %
10 2 **Storage Temperature:** Elevated (molten)
10 3 **Inert Atmosphere:** Required
10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

II-RR

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable solid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	N A
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight.** 123 99
13 3 **Boiling Point: at 1 atm.** 536°F = 280°C = 553 2°K
13 4 **Freezing Point:** 111 4°F = 44 1°C = 317°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 82 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Cal per mole per °mole

NOTES

REVISED 1978

PAN	# PHTHALIC ANHYDRIDE

Common Synonyms
Phthalic acid anhydride
PAN

Solid flakes or liquid (heated) | Colorless or pale yellow | Choking odor

Solid sinks in water; liquid solidifies and sinks in water

Fire

Combustible

Exposure

DUST
Irritating to eyes, nose, and throat
If inhaled, will cause coughing

LIQUID OR SOLID
Will burn skin or eyes
Harmful if swallowed

Water Pollution

Effect of low concentration on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Dispose and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2-Benzenedicarboxylic acid anhydride; 1,3-Dioxophthalan; PAN; Phthalandione; Phthalic acid anhydride

3.2 **Coast Guard Compatibility Classification:** Organic anhydride

3.3 **Chemical Formula:** $C_8H_4O_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid (flakes) or liquid

4.2 **Color:** Colorless or pale yellow

4.3 **Odor:** Characteristic choking odor; irritating acrid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Coveralls and/or rubber apron; rubber shoes or boots; chemical goggles and/or face shield; Bureau of Mines organic vapor respirator (Type C) for gauntlet type leather or rubber gloves

5.2 **Symptoms Following Exposure:** Solid irritates skin and eyes, causing coughing and sneezing. Liquid causes severe thermal burns.

5.3 **Treatment for Exposure:** INHALATION: gargle with water and use a sedative cough mixture. INGESTION: induce vomiting and give water, milk, or vegetable oil. SKIN OR EYE CONTACT: Flush with water for at least 5 min. If burned by molten material, remove as much solid as possible; wash off the remainder in cold water and then treat the burn.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm

5.5 **Short-Term Inhalation Limits:** 4 ppm for 5 min

5.6 **Toxicity by Ingestion:** Grade 2; LD$_{50}$: 0.5 to 5 g/kg (rats)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the eyes and first degree burns on short exposure; may cause secondary burns on long exposure

5.10 **Odor Threshold:** 0.33 - 0.72 mg/m^3

6 FIRE HAZARDS

6.1 **Flash Point:** 329°F (O.C.); 305°F (C.C.)

6.2 **Flammable Limits in Air:** 1.7 - 10.5%

6.3 **Fire Extinguishing Agents:** Water fog, dry chemical, carbon dioxide, or foam

6.4 **Fire Extinguishing Agents Not to be Used:** Water may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 1098°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Solid has very slow reaction; no hazard. Liquid spatters when in contact with water

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Water and sodium bicarbonate

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** None

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** > Stoppers 96 hr TL$_m$ (flathead minnow) 12 ppm fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 1060 % 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp.
   Plastics Division
   Morristown, N.J. 07960

2. Koppers Co. Inc.
   Organic Material Dept.
   Koppers Bldg.
   Pittsburgh, Pa. 15219

3. Monsanto Co.
   Monsanto Industrial Chemicals Co.
   800 North Lindbergh Blvd.
   St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Flake, molten, commercial 99.8

10.2 **Storage Temperature:** 268-320°F (liquid); Ambient (solid)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

Hor XXX

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxin	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 148.12

13.3 **Boiling Point at 1 atm.:** 844.3°F = 284.6°C = 557.8°K

13.4 **Freezing Point:** 268°F = 131°C = 4.45°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.20 at 131°C (liquid); 1.53 at 20°C (solid)

13.8 **Liquid Surface Tension:** 35 dynes/cm = 0.035 N/m at 131°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** 194 Btu/lb = 108 cal/g = 4.40 × 10^5 J/kg

13.13 **Heat of Combustion:** −9573 Btu/lb = −5263 cal/g = −220.4 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** −27 Btu/lb = −70 cal/g = −2.96 × 10^5 J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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PPZ

PIPERAZINE

Common Synonyms
Hexahydro-1 4-diazine
Hexahydropyrazine
Diethylenediamine
Lumbrical
Piperazidine
Pyrazine hexahydride

Solid | White | Mild fishy odor

Sinks and mixes with water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Will burn eyes
Irritating to eyes.
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flash

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diethylenediamine Hexahydro-1 4-diazine, Hexahydropyrazine Lumbrical Piperazidine, Pyrazine hexahydride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $NHCH_2CH_2NHCH_2CH_2$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Mild amine like

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Monogoggles or face shield rubber gloves dust mask

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat Ingestion causes irritation of mouth and stomach, has been known to cause severe allergic reaction Contact with eyes causes burns Repeated contact with skin may cause irritation and sensitization

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amount of water induce vomiting get medical attention EYES flush with plenty of water for at least 15 min get medical attention SKIN wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 0 5 g kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 295°F O C (molten solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may cause flashing

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 311°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** May be corrosive to aluminum magnesium and zinc

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Jefferson Chemical Co Inc
1121 Richmond Avenue
P O Box 1900
Houston Texas 77002

2 Union Carbide Corp
Chemicals and Plastics Div
270 Park Avenue
New York N Y 10017

3 Eastman Organic Chemicals
Rochester N Y 14650

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial 99+% may also be shipped as a solid hexahydrate whose hazardous properties are similar

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 86

13 3 **Boiling Point at 1 atm:** 299°F = 148°C = 421°K

13 4 **Freezing Point:** 221°F = 106°C = 379°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −14 430 Btu lb = −8 200 cal g = −343 × 10³ J kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** −34 9 Btu lb = −19 4 cal g = −0 812 × 10³ J kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

PLB POLYBUTENE

Common Synonyms Butene resins Polyisobutylene waters	Oily liquid Colorless Odorless Floats on water
Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Foulant to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical means
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Butene resins
Polyisobutylene plastics
Polyisobutylene resins
Polyisobutylene waxes

3 2 **Coast Guard Compatibility Classification.** Olefin

3 3 **Chemical Formula:** $-(C(CH_3)_2CH_2)_n-$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Data not available

4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield

5 2 **Symptoms Following Exposure:** Low toxicity. Vapor may cause irritation at high concentration

5 3 **Treatment for Exposure:** INHALATION: remove victim to open air

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Grade 0 [Data not available]

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Vapor may cause mild irritation

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically nonirritating

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** [illegible]

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Water fog. Foam. Dry chemical. Carbon dioxide.

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** [illegible]

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NFI

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm.** Very high

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.81 - 0.91 at 15°C (liquid)

13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** (est.) 50 dynes/cm = 0.05 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion.** (est.) = 20,000 Btu/lb = -11,200 cal/g = -470 x 10^3 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** (est.) = 9 Btu/lb = -5 cal/g = -0.2 x 10^3 J/kg

13 16 **Heat of Polymerization** Not pertinent

[illegible]

NOTES

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PCB — POLYCHLORINATED BIPHENYL

Common Synonyms PCB Chlorinated biphenyl Aroclor	Oily liquid to solid powder Light yellow liquid or white powder Weak odor Sinks in water
Fire	Combustible
Exposure	LIQUID OR SOLID Irritating to skin and eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-1

Isolate spill or leak area immediately. Notify persons downwind of spill or leak. Keep unnecessary people away; stay upwind. Ventilate closed spaces before entering. Wear self-contained breathing apparatus and rubber protective clothing. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean, non-sparking tools to collect absorbed material. Large Spills: Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor; but may not prevent ignition in closed spaces. Drain and flush with water.

2. LABELS

No hazard label required by DOT. Coast Guard Regulations require "Poison" label.

3 CHEMICAL DESIGNATIONS

- 3.1 **Synonyms:** Aroclor, Chlorinated biphenyl, Halogenated aromatic, PCB, Polychlorobiphenyls
- 3.2 **Coast Guard Compatibility Classification.** Not applicable
- 3.3 **Chemical Formula:** $C_{12}H_{(10-n)}Cl_n$
- 3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

- 4.1 **Physical State (as shipped):** Liquid or solid
- 4.2 **Color:** Pale yellow (liquid) to white (solid)
- 4.3 **Odor:** Practically odorless

5 HEALTH HAZARDS

- 5.1 **Personal Protective Equipment.** Gloves and protective garments
- 5.2 **Symptoms Following Exposure:** Acne-form eruptions
- 5.3 **Treatment for Exposure:** SKIN: wash with soap and water
- 5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 to 1.0 mg/m³
- 5.5 **Short-Term Inhalation Limits.** Data not available
- 5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 1010 mg/kg
- 5.7 **Late Toxicity:** Causes chromosomal abnormalities in rats, birth defects in birds
- 5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and cause eye and lung injury. They cannot be tolerated even at low concentrations
- 5.9 **Liquid or Solid Irritant Characteristics.** Contact with skin may cause irritation
- 5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

- 6.1 **Flash Point:** >286°F
- 6.2 **Flammable Limits in Air:** Data not available
- 6.3 **Fire Extinguishing Agents:** Water, dry chemical or carbon dioxide
- 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
- 6.5 **Special Hazards of Combustion Products.** Irritating and poisonous gases produced
- 6.6 **Behavior in Fire:** Not pertinent
- 6.7 **Ignition Temperature:** Data not available
- 6.8 **Electrical Hazard:** Not pertinent
- 6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
- 7.2 **Reactivity with Common Materials:** No reaction
- 7.3 **Stability During Transport:** Stable
- 7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
- 7.5 **Polymerization.** Not pertinent
- 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 0.23 ppm/96 hours / Flow-through / Fresh water; 0.140 ppm/96 hours / Flow-through / Salt water
- 8.2 **Waterfowl Toxicity:** LD₅₀ 5 gm/kg or mg/kg/day
- 8.3 **Biological Oxygen Demand (BOD).** None
- 8.4 **Food Chain Concentration Potential.** High

9 SELECTED MANUFACTURERS

Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Missouri

10 SHIPPING INFORMATION

- 10.1 **Grades or Purity:** Technical grade is a mixture of several chlorinated biphenyls primarily the tetra-, penta-, and hexa-chlorobiphenyl. Mixtures by weight
- 10.2 **Storage Temperature:** Ambient
- 10.3 **Inert Atmosphere:** No requirement
- 10.4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
- 12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
- 12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid or liquid
- 13.2 **Molecular Weight:** Not pertinent
- 13.3 **Boiling Point at 1 atm:** Very high
- 13.4 **Freezing Point:** Not pertinent
- 13.5 **Critical Temperature:** Not pertinent
- 13.6 **Critical Pressure:** Not pertinent
- 13.7 **Specific Gravity:** 1.3 to 1.8 @ 68°F
- 13.8 **Liquid Surface Tension:** Not pertinent
- 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
- 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
- 13.12 **Latent Heat of Vaporization:** Not pertinent
- 13.13 **Heat of Combustion:** Not pertinent
- 13.14 **Heat of Decomposition.** Not pertinent
- 13.15 **Heat of Solution.** Not pertinent
- 13.16 **Heat of Polymerization** Not pertinent

(Continued on page 5 and 6)

NOTES

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PPI — POLYMETHYLENE POLYPHENYL ISOCYANATE

Common Synonyms			
PAPI	Liquid	Dark brown	Weak odor
	Sinks in water		

Fire

Combustible
Containers may explode in fire

Exposure

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning: poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** PAPI

3.2 **Coast Guard Compatibility Classification:** Isocyanate

3 **Chemical Formula:** $C_8H_6NOCH_2C_6H_3NCO$ and polymer

3.4 **IMCO/United Nations Numerical Designation.** None

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Dark brown

4.3 **Odor:** Very weak

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Avoid contact. Wear chemical cartridge mask, goggles, face shield, rubber gloves and chemical protective clothing.

5.2 **Symptoms Following Exposure:** Inhalation causes headache, shortness of breath and reduced pulmonary function, wheezing, cough and sputum production. Contact with eyes irritates eyes and skin. Ingestion causes gastrointestinal upset and death.

5.3 **Treatment for Exposure:** *Get medical attention immediately for all exposures to this compound.* INHALATION: remove victim to fresh air and clear throat and respiratory passages; oxygen can be given by qualified personnel if victim is not breathing. If victim has stopped breathing, give artificial respiration. Three to eight hours may be required. EYES: immediately wash with large amounts of water, at least 5 min. SKIN: flush immediately with water, remove contaminated clothing, shoes and leather goods and wash skin with soap and water. INGESTION: induce vomiting at least 3 times by giving water and then tablespoon of salt per cup. Follow with aqueous suspension of activated charcoal. Treat as indicated.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.02 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion.** Grade III. LD_{50} = 2.2 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is considered irritating such that personnel will not usually tolerate moderate or high vapor exposures.

5.9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure; may cause second-degree burns on prolonged exposure.

Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 405°F COC

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to form heavy solid and liberates carbon dioxide gas. Dangerous pressures can build up if container is sealed.

7.2 **Reactivity with Common Materials.** Not hazardous reaction when mixed with wet

7.3 **Stability During Transport:** Stable if kept sealed and dry

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

The Upjohn Company
Polymer Chemicals Division
P.O. Box 688
LaPorte, Texas 77571

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 95% methylene bisphenyl isocyanate plus 95% polymer

10.2 **Storage Temperature:** 70°F

10.3 **Inert Atmosphere:** Low pressure dry nitrogen

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

XOXY

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	4
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemicals	
Water	
Self Reaction	

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 400 (approx)

13.3 **Boiling Point at 1 atm:** >392°F = >200°C = >473°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.24 at 25°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

PPA	POLYPHOSPHORIC ACID

Common Synonyms: Condensed phosphoric acid

Liquid | Colorless | Odorless

Sinks and mixes with water

Fire

Not flammable
Flammable gas may be produced on contact with metal

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook [illegible]

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible] acid

3.2 Coast Guard Compatibility Classification: [illegible]

3.3 Chemical Formula: $H_{n+2}P_nO_{3n+1}$

3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid

4.2 Color: [illegible]

4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]

5.2 Symptoms Following Exposure: [illegible]

5.3 Treatment for Exposure: INGESTION: [illegible] INHALATION: [illegible] SKIN OR EYES: [illegible]

5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]

5.5 Short-Term Inhalation Limits: [illegible]

5.6 Toxicity by Ingestion: [illegible]

5.7 Late Toxicity: [illegible]

5.8 Vapor (Gas) Irritant Characteristics: [illegible]

5.9 Liquid or Solid Irritant Characteristics: [illegible]

5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible]

6.2 Flammable Limits in Air: [illegible]

6.3 Fire Extinguishing Agents: [illegible]

6.4 Fire Extinguishing Agents Not to be Used: [illegible]

6.5 Special Hazards of Combustion Products: [illegible]

6.6 Behavior in Fire: [illegible]

6.7 Ignition Temperature: [illegible]

6.8 Electrical Hazard: [illegible]

6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]

7.2 Reactivity with Common Materials: [illegible]

7.3 Stability During Transport: [illegible]

7.4 Neutralizing Agents for Acids and Caustics: [illegible]

7.5 Polymerization: [illegible]

7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]

8.2 Waterfowl Toxicity: [illegible]

8.3 Biological Oxygen Demand (BOD): [illegible]

8.4 Food Chain Concentration Potential: [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades of Purity: [illegible]

10.2 Storage Temperature: [illegible]

10.3 Inert Atmosphere: [illegible]

10.4 Venting: Open or pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook [illegible]

NPAA

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: [illegible]

12.2 NAS Hazard Rating for Bulk Water Transportation: [illegible]

12.3 NFPA Hazard Classifications: [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: [illegible]

13.2 Molecular Weight: [illegible]

13.3 Boiling Point at 1 atm: [illegible]

13.4 Freezing Point: [illegible]

13.5 Critical Temperature: [illegible]

13.6 Critical Pressure: [illegible]

13.7 Specific Gravity: [illegible]

13.8 Liquid Surface Tension: [illegible]

13.9 Liquid-Water Interfacial Tension: [illegible]

13.10 Vapor (Gas) Specific Gravity: [illegible]

13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]

13.12 Latent Heat of Vaporization: [illegible]

13.13 Heat of Combustion: [illegible]

13.14 Heat of Decomposition: [illegible]

13.15 Heat of Solution: [illegible]

13.16 Heat of Polymerization: [illegible]

[illegible]

NOTES

REVISED 1978

PLP	**POLYPROPYLENE**

Common Synonyms			
Propene polymer	Solid	Tan to white	Odorless
	Floats on water		

Fire	Combustible
Exposure	DUST Not harmful SOLID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Manual, Spill Control Actions

Mechanical containment

2 LABELS

No hazard labels required by U.S. Coast Guard, Federal Register, 1965

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Propene polymer

3.2 **Coast Guard Compatibility Classification:** Inert

3.3 **Chemical Formula:** $(C_3H_6)_n$ where n is large

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Translucent white

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Eye goggles

5.2 **Symptoms Following Exposure:** No adverse effects

5.3 **Treatment for Exposure:** None required

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Cancer studies have not been performed on this material

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Diamond Shamrock Corp.
(address illegible)
Cleveland, Ohio 44114

Exxon Chemical Co.
(address illegible)
Houston, Texas 77027

Amoco Chemicals Corp.
(address illegible)
Chicago, Ill. 60601

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not rated

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** Mixture

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.90 at 20°C (water)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** (Solid) -19,900 Btu/lb = -11,060 cal/g = -463.0 kJ/mole

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 2 and 3)

NOTES

PGC POLYPROPYLENE GLYCOL

Common Synonyms Polyoxypropylene glycol Polyoxypropylene glycol Pluriol polyol	Liquid May float or sink in water	Colorless	Odorless or mild sweet odor

Fire	Combustible
Exposure	LIQUID Irritating to eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Issue warning - water contaminant
Mechanical containment
Should be removed
Disperse and flush

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Polyoxypropylene glycol Polyoxypropylene ether PPG Pluriol polyol Polypropylene glycols P400 to P4000 Thanol PPG

3 2 **Coast Guard Compatibility Classification** Alcohols (6)

3 3 **Chemical Formula** $HOCH(CH_3)CH_2O[CH(CH_3)CH_2O]_nH$ n averages 2 – 68

Continued on page 4

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color** Color varies clear lights colored

4 3 **Odor** None slight sweet faint ether like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses or face shield rubber gloves

5 2 **Symptoms Following Exposure** The compound has very low toxicity few if any symptoms will be observed Contact of liquid with eyes causes slight transient pain and irritation similar to that caused by a mild soap

5 3 **Treatment for Exposure** EYES flush with water until mild irritation is gone

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion** (depends on molecular wt)
Grade 1 oral LD_{50} 5 150 mg/kg (rats)
Grade 1 LD_{50} 5 1 5 g/kg
Grade 0 $LD_{50} > 15$ g/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** 300 495 F O C

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents** Water dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 Union Carbide Corp
Chemicals and Plastics Division
270 Park Avenue
New York N Y 10017

2 BASF Wyandotte Corporation
Industrial Chemicals Group
1609 Biddle Avenue
Wyandotte Mich 48192

3 Dow Chemical Co
Midland Mich 48640

10. SHIPPING INFORMATION

10 1 **Grades of Purity**
Low mol wt (miscible with water)
Medium mol wt (2% soluble in water)
High mol wt (insoluble in water)

10 2 **Storage Temperature:** Below 140 F

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

NLNY

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight** Variable 200 to 2000

13 3 **Boiling Point at 1 atm** Not pertinent to decompose

13 4 **Freezing Point** −22 to −85 F
= −30 to −50 C = 243 to 223 K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 1 012 at 20 C (liquid)

13 8 **Liquid Surface Tension** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** −14 200 Btu lb
= −7 900 cal g = −330 × 10³ J kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5

3 CHEMICAL DESIGNATIONS (Cont'd)

3 4 **IMCO/United Nations Numerical Designation** Not listed

PGM	POLYPROPYLENE GLYCOL METHYL ETHER

Comm Synonyms
Polyoxypropylene glycol methyl ether
Poly (propylene glycol) methyl ether

Liquid | Colorless | Odorless

Mixes with water

Fire

Fire da a not available

Exposure

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Polyoxypropylene glycol methyl ether
Poly (propylene glycol) methyl ether

3 2 **Coast Guard Compatibility Classification:** Glycol ether

3 3 **Chemical Formula:** $CH_3O(CH_2O)_nH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield

5 2 **Symptoms Following Exposure.** Low toxicity In high concentrations may be mildly anesthetic
Direct eye contact produces slight irritation

5 3 **Treatment for Exposure** Remove victim from exposure

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas, Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Hazard to skin considered minor

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Data not available

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents** Data not available

6 4 **Fire Extinguishing Agents Not to be Used** Data not available

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature.** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017
(No bulk shipments)

10 SHIPPING INFORMATION

10 1 **Grades of Purity** Technical

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook Co 446 3)

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight** Data not available

13 3 **Boiling Point at 1 atm.** Very high

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** (est.) 0.90 at 20° C (liquid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** (est.) 1.00

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** (est.) = -17,000 Btu/lb = -9360 cal/g = -28° × 10⁶ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(See next page)

NOTES

REVISED 1978

PTM	POTASSIUM, METALLIC

Common Synonyms	Solid	Silver white	Odorless
	Reacts violently with water Flammable gas is produced		

Fire	Combustible IGNITES WHEN EXPOSED TO WATER OR MOISTURE Flammable gas is produced on contact with water
Exposure	SOLID Will burn skin and eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

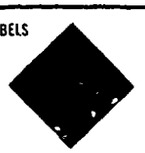
1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
corrosive
Restrict access
Disperse and flush

2. LABELS





3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula.** K
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Silvery white
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure:** Contact with eyes or skin causes severe burn
5 3 **Treatment for Exposure:** EYES or SKIN: flush with water; treat caustic burns
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion.** Not pertinent
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point.** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air.** Not pertinent
6 3 **Fire Extinguishing Agents** Graphite sand sodium chloride
6 4 **Fire Extinguishing Agents Not to be Used** Water foam carbon dioxide or halogenated hydrocarbons
6 5 **Special Hazards of Combustion Products**
6 6 **Behavior in Fire.** Reacts violently with water forming flammable and explosive hydrogen gas May ignite spontaneously in air
6 7 **Ignition Temperature** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently to form flammable hydrogen gas and a strong caustic solution
7 2 **Reactivity with Common Materials:** May ignite combustible materials if they are dry
7 3 **Stability During Transport:** Stable if protected from air and moisture
7 4 **Neutralizing Agents for Acids and Caustics** Caustic formed by reaction with water should be flushed with water; then area can be rinsed with dilute acetic acid
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 80 ppm/24 hr mosquito fish 11 m fresh water
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential** none

9 SELECTED MANUFACTURERS

1 Kawecki Berylco Industries Inc
220 East 42 St
New York N Y 10017

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

3 Ventron Corp
P O Box 159
Beverly Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99 9+ (Shipped under oil)
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** Inerted
10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

RR

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** 39
13 3 **Boiling Point at 1 atm** 1 425°F = 774°C = 1047°K
13 4 **Freezing Point:** 145°F = 63°C = 336°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 0 86 at 20°C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** −2 093 Btu lb = −1 113 cal g = −46 57 × 10 J kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** −2 104 Btu lb = −1 169 cal g = −48 91 × 10 J kg
13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

PAS POTASSIUM ARSENATE

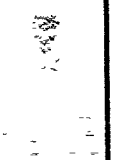
Common Synonyms
Macquer's Salt
Potassium acid arsenate
Potassium dihydrogen arsenate

Solid | White | Odorless

Mixes with water

Fire

Not flammable



DUST
POISONOUS IF INHALED OR SWALLOWED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4)

Issue warning, poison water contaminant
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Macquer's salt, Potassium acid arsenate, Potassium dihydrogen arsenate

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** KH_2AsO_4

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1677

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color.** White

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust respirator, rubber gloves

5 2 **Symptoms Following Exposure:** Dust may irritate eyes. Ingestion or severe exposure by inhalation can cause burning of throat and mouth, abdominal pain, vomiting, diarrhea with hemorrhage, dehydration, jaundice, and collapse

5 3 **Treatment for Exposure** EYES: flush with water to remove dust. INGESTION: immediately induce vomiting of intestinal tract by inducing vomiting, using gastric lavage and saline, cathartic, see physician at once, consider possible development of arsenic poisoning.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0.5 mg/m³ (as arsenic)

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity:** May be carcinogenic, arsenic poisoning may develop

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 240 ppm as As TLm minnows survived

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

2 Ceras, Inc.
13460 W. Silver Spring Rd.
Menomonee Falls, Wis. 53051

3 Fielding Chemical Co.
Forrest and Halladay Street
Jersey City, N.J. 07305

10 SHIPPING INFORMATION

10 1 **Grades of Purity** Commercial

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

NN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight** 180.0

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point** 980°F = 288°C = 561°K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 2.8 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** 49 Btu/lb = 27 cal/g = 1.1 × 10⁵ J/kg

13 16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

PBO	# POTASSIUM BINOXALATE

Common Synonyms	Solid	White	Odorless
Potassium acid oxalate Salt of sorrel Sal acetosella	Sinks in water		

Fire	Not flammable
Exposure	DUST Irritating to eyes nose and throat If inhaled will cause coughing difficult breathing or loss of consciousness SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	Effect of low concentrations on aquatic life if unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Potassium acid oxalate Sal acetosella Salt of sorrel

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula** KHC_2O_4

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color.** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust mask goggles or face shield protective gloves

5 2 **Symptoms Following Exposure** Inhalation of dust causes irritation of nose and throat Ingestion causes burning pain in throat esophagus and stomach exposed areas or mucous membranes turn white vomiting severe purging weak pulse and cardiovascular collapse if death is delayed neuromuscular symptoms develop Contact with dust irritates eyes and may cause mild irritation to skin

5 3 **Treatment for Exposure.** INHALATION move to fresh air if exposure to dust is severe get medical attention INGESTION get immediately to mouth a dilute solution of any soluble calcium salt (calcium lactate milk water lime solution or even milk) Large amounts of water are required administer gastric lavage with dilute lime water consult physician watch for edema of the glottis and get medical attention if esophagus LYES flash with water for at least 15 min SKIN wash well with soap and water

5 4 **Toxicity by Inhalation, (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 3 LD_{50} 500 mg/kg

5 7 **Late Toxicity.** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Below 80 C dissolves in water and reacts to form the much less soluble potassium tetraoxalate which separates out

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 J T Baker Chemical Co
Phillipsburg N J 08865

2 Fielding Chemical Co
P O Box 21
Jersey City N J 07303

10 SHIPPING INFORMATION

10 1 **Grades of Purity** Technical

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

HSS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Poison Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight.** 254 11

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity** 2 11 at 20 C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued under Notes

NOTES

PCR — POTASSIUM CHLORATE

Common Synonyms
Potcrate
Chlorate of potassium
Chlorate of potash

Solid | White | Odorless

Mixes with water

Fire

Not flammable
May cause fire on contact with combustibles
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes nose and throat

SOLID
Irritating to skin and eyes
If swallowed will cause nausea vomiting or loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning on drinking material
water contaminant
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Chlorate of potash
Chlorate of potassium potcrate

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula.** $KClO_3$

3 4 **IMCO/United Nations Numerical Designation.** No 1485

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color** White

4 3 **Odor** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust mask rubber gloves goggles protective clothing to prevent contact with skin

5 2 **Symptoms Following Exposure** Inhalation of dust can irritate nose and throat Contact with eyes or skin causes irritation Ingestion causes abdominal pain nausea vomiting convulsions collapse

5 3 **Treatment for Exposure** EYES flush with water for at least 15 min SKIN wash with soap and water INGESTION dilute by drinking soaps or salty water to induce vomiting Get physician

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Grade 2 LD$_{50}$ 0 5 to 5 g kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable but may cause fire upon contact with combustibles

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents** Water on adjacent fires

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic fumes are formed in fires

6 6 **Behavior in Fire** Decomposes when hot to form oxygen which increases severity of fire

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** Contact with combustible material may cause fire

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Pennwalt Corporation
Chemicals Division
Three Parkway
Philadelphia Pa 19102

2 Hooker Chemical Corporation
Specialty Chemicals Division
P O Box 344
Niagara Falls N Y 14302

3 Mallinckrodt Chemical Works
Industrial Chemicals Division
Second and Mallinckrodt Streets
P O Box 5439
St Louis Mo 63160

10. SHIPPING INFORMATION

10 1 **Grades or Purity** Commercial 99 2% Reagent Purified

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Oxidizing material

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	1
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight.** 122 6

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point**
690°F = 360°C = 633 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 2 34 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** −176 Btu lb
= −98 cal g = −4 1 × 10^5 J kg

13 15 **Heat of Solution** 149 Btu lb
= 83 cal g = 3 43 × 10^5 J kg

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

PCH	# POTASSIUM CHROMATE

Common Synonyms
Potassium chromate (VI)
Neutral potassium chromate

Solid — Bright yellow — Odorless

Sinks and mixes with water

Fire

Not flammable
Will increase the intensity of a fire
May cause fire on contact with combustibles

Exposure

DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea vomiting or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Neutral potassium chromate Potassium chromate (VI)
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula** K_2CrO_4
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color:** Bright yellow
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bur. of Mines approved filter type respirator, chemical safety goggles, rubber boots and apron, safety hat, face shield.

5 2 **Symptoms Following Exposure** Inhalation causes local irritation of mucous membranes continuing nose irritation can result in perforation of nasal septum. Ingestion may cause violent gastroenteritis, circulatory collapse, vertigo, coma and toxic nephritis; ingestion of excessive quantities can be fatal. Contact with eyes causes severe irritation and conjunctivitis. Repeated or prolonged exposure to dust, mist or solutions may cause dermatitis; contact with breaks in the skin may cause chrome sore, appearing as slow healing hard raised ulcers which leave the area vulnerable to infection.

5 3 **Treatment for Exposure** INHALATION move to fresh air. INGESTION give large amounts of water, induce vomiting, treat for peripheral vascular shock, gotten to get medical attention. EYES flush with water for at least 15 min., get medical attention. SKIN flush with water if irritation persists, get medical attention.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³ as K_2CrO_4
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion** Grade 3 LD_{50} 50-500 mg/kg
5 7 **Late Toxicity:** Lung cancer may occur
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable but may stress fire
6 2 **Flammable Limits in Air** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire** May increase intensity of fire if in contact with combustible materials. Coat containers and piled materials with plenty of water.
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** In contact with combustible materials may cause fire
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
48-96ppm 96-hr fathead minnow TL_m soft water
1-5ppm* silver salmon, toxic salt water
*Time period not specified
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential:** Plants can absorb compound from water and pass it on up the food chain. Bioconcentrative up to 2,000 fold. Not likely to be a problem in a spill situation.

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
P O Box 1057R
Morristown N J 07960
2 J T Baker Chemical Co
Phillipsburg N J 08865
3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Reagent 99% CP Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 194.20
13 3 **Boiling Point at 1 atm** No pertinent, decomposes
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** No pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.73 at 15°C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** No pertinent

(continued on page 2)

NOTES

PTC

POTASSIUM CYANIDE

Common Synonyms	Solid crystals	White	Almond odor
	Sinks and mixes with water		

Fire	Not flammable
Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, Guide 4

Isolate spill area
Ventilate area
Evacuate area
Chemical reaction not violent

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cyanide

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula** KCN

3.4 **IMCO United Nations Numerical Designation:** 1680

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color:** White

4.3 **Odor:** Like bitter almonds or peach pits

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear clothing as specified in S.R. Guide Manual provided. Keep away from heat and flame. When handling, keep container closed. Wash hands and face thoroughly after handling.

5.2 **Symptoms Following Exposure:** Inhalation of dust or ingestion of solid or solution may be fatal. Dust irritating to eyes, nose and throat. Solution on skin may be absorbed in poisonous amounts. Solution irritating to skin. Symptoms of exposure may include weakness, headache, confusion, nausea, vomiting, shortness of breath, collapse, convulsions, coma.

5.3 **Treatment for Exposure:** INGESTION: Induce vomiting by giving 2 glasses of water and finger down throat. Repeat. If conscious, give 1 teaspoon sodium thiosulfate in water. Repeat. Call physician immediately. Keep patient warm and quiet. Do not induce vomiting if patient is unconscious, convulsing or having severe spasms. INHALATION: Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call physician immediately. SKIN: Wash with soap and water. Remove contaminated clothing and shoes. EYES: Wash with plenty of water for at least 15 minutes. Call physician immediately.

* Emergency personnel should avoid direct contact and breathing the vapors. Wear self-contained breathing apparatus.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** No data

5.5 **Short-Term Inhalation Limits.** No data

5.6 **Toxicity by Ingestion:** Grade 4 (Extremely hazardous)

Continued on next page

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** When potassium cyanide dissolves in water a mild reaction occurs and some poisonous hydrogen cyanide gas is released. This gas is not hazardous except in an enclosed space. If the water is acidic, however, toxic amounts of the gas will form at once.

7.2 **Reactivity with Common Materials.** Contact with even weak acids causes formation of deadly hydrogen cyanide gas.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 96-hr ppm TLm/96 hrs. Bluegill: 0.49 ppm 48-hr TLm/96 hrs. saltwater

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 0% of theoretical in 7 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Specialty Chemicals Division
Baker Road
Baton Rouge, LA 70821

2. E. I. du Pont de Nemours & Co., Inc.
Electrochemicals Dept.
Wilmington, DE 19898

3. Harshaw Chemical Corp.
1247 West 3rd St.
Cleveland, OH 44113

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 96% 97%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Sealed containers must be stored in a well-ventilated area

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, Guide 6

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poison B liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 65.12

13.3 **Boiling Point at 1 atm:** 1625°C

13.4 **Freezing Point:** 634.5°C

13.5 **Critical Temperature:** No data

13.6 **Critical Pressure.** No data

13.7 **Specific Gravity:** 1.52 at 0°C/4°C

13.8 **Liquid Surface Tension:** No data

13.9 **Liquid-Water Interfacial Tension:** No data

13.10 **Vapor (Gas) Specific Gravity:** No data

13.11 **Ratio of Specific Heats of Vapor (Gas).** No data

13.12 **Latent Heat of Vaporization** No data

13.13 **Heat of Combustion:** No data

13.14 **Heat of Decomposition:** No data

13.15 **Heat of Solution:** No data

13.16 **Heat of Polymerization:** Not pertinent

5 HEALTH HAZARDS (Cont'd.)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Solutions may be moderately irritating to eyes and skin. Dust irritating to eyes, nose and throat.

5.9 **Liquid or Solid Irritant Characteristics.** Moderately irritating to eyes, nose and throat. Solutions may cause dermatitis upon prolonged contact with skin.

5.10 **Odor Threshold:** No data

REVISED 1978

PDT	POTASSIUM DICHLORO-s-TRIAZINETRIONE

Common Synonyms

Potassium dichloroisocyanurate

Solid White Chlorine-like odor

Mixes with water

Fire

Not flammable
May cause fire on contact with combustibles
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning - oxidizing material in water contaminant
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Potassium dichloroisocyanurate

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula:** $KC_3N_3O_3Cl_2$

3.4 **IMCO/United Nations Numerical Designation.** None

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Faint Chlorine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, chemical cartridge respirator, mask, goggles, rubber gloves and other protective clothing to prevent contact with skin

5.2 **Symptoms Following Exposure:** Dust causes coughing, choking, irritation to the eyes and skin, burning and redness of skin. Ingestion causes burning of mouth, throat, stomach

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. EYES: irrigate with running water for 15 min. SKIN: wash with soap or detergent. INGESTION: induce vomiting and call physician

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but may cause fire upon contact with combustibles

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** May form toxic chlorine and other gases in fire

6.6 **Behavior in Fire:** Decomposition can be initiated with a heat source and can propagate throughout the mass with the evolution of dense fumes. Containers can explode when heated

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms a bleach solution, the reaction is not violent

7.2 **Reactivity with Common Materials:** Contact with most hydrocarbons, organic matter or easily chlorinated or oxidized materials may result in fire. Avoid oil, grease, sawdust, floor sweepings, other easily oxidized organic compounds

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

FMC Corporation
Industrial Chemical Division
633 Third Avenue
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 90-92% available chlorine

10.2 **Storage Temperature:** Cool, ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	0
Reactivity (Yellow)	1
	OX

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm.** Solid

*13.2 **Molecular Weight:** 233.1

*13.3 **Boiling Point at 1 atm:** No data, decomposes

*13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature.** Not pertinent

*13.6 **Critical Pressure.** Not pertinent

*13.7 **Specific Gravity:** 0.96 at 20°C (solid)

*13.8 **Liquid Surface Tension.** Not pertinent

*13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

*13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** Not pertinent

*13.14 **Heat of Decomposition.** Data not available

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 2

NOTES

PTD	POTASSIUM DICHROMATE

Common Synonyms
Potassium bichromate
Bichrome

Solid crystals — Red to orange — Odorless

Sinks and mixes with water

Fire

Not flammable
May cause fire on contact with combustibles

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled, will cause difficult breathing

SOLIDS
Will burn skin and eyes
If swallowed, will cause nausea, vomiting or loss of consciousness

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms
3.2 Coast Guard Compatibility Classification: Not applicable
3.3 Chemical Formula: $K_2Cr_2O_7$
3.4 IMCO United Nations Numerical Designation.

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: Orange-red
4.3 Odor: Odorless

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INGESTION
SKIN
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits
5.6 Toxicity by Ingestion
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics
5.10 Odor Threshold.

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents: Water
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water
7.2 Reactivity with Common Materials:
7.3 Stability During Transport
7.4 Neutralizing Agents for Acids and Caustics
7.5 Polymerization
7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NN

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
ORM A
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm.
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm.
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion
13.14 Heat of Decomposition.
13.15 Heat of Solution.
13.16 Heat of Polymerization

NOTES

REVISED 1978

PTH	# POTASSIUM HYDROXIDE

Common Synonyms
Caustic potash
Lye

Solid crystals or waters liquid — White solid or colorless liquid — Odorless

Solid sinks and fumes slowly with water. Liquid mixes with water.

Fire	Not flammable Flammable gas may be produced on contact with metals May cause fire on contact with moisture and combustibles
Exposure	DUST OR MIST Irritating to eyes, nose and throat Harmful if inhaled SOLID OR LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

[illegible]

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]
3.2 Coast Guard Compatibility Classification: [illegible]
3.3 Chemical Formula: KOH
3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]
4.2 Color: White
4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: [illegible]
5.3 Treatment for Exposure: [illegible]
INGESTION: [illegible]
EYES: [illegible]
SKIN: [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: [illegible]
5.6 Toxicity by Ingestion: Grade 3, oral rat LD_{50} = 364 mg/kg
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: [illegible]
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: [illegible]
6.6 Behavior in Fire: [illegible]
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: [illegible]
6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]
7.2 Reactivity with Common Materials: [illegible]
7.3 Stability During Transport: [illegible]
7.4 Neutralizing Agents for Acids and Caustics: [illegible]
7.5 Polymerization: [illegible]
7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades of Purity: Technical flake, 85% and USP pellets, 90%
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: [illegible]
10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NS

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Corrosive Material
12.2 NAS Hazard Rating for Bulk Water Transportation: [illegible]
12.3 NFPA Hazard Classifications:

Category	Classification
[illegible]	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 56
13.3 Boiling Point at 1 atm: Very high
13.4 Freezing Point: [illegible]
13.5 Critical Temperature: [illegible]
13.6 Critical Pressure: [illegible]
13.7 Specific Gravity: [illegible]
13.8 Liquid Surface Tension: [illegible]
13.9 Liquid-Water Interfacial Tension: [illegible]
13.10 Vapor (Gas) Specific Gravity: [illegible]
13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: [illegible]
13.15 Heat of Solution: [illegible]
13.16 Heat of Polymerization: [illegible]

NOTES

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PTI	# POTASSIUM IODIDE

Common Synonyms	Solid crystals White Odorless Sinks and mixes with water
Fire	Not flammable
Exposure	SOLID Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Note Response Methods Handbook Page 444.4

1.1 Hazard Category
1.2 Physical Hazard

2 LABELS

2.1 Label Required (Poison)
2.2 Placard Required

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: None
3.2 Coast Guard Compatibility Classification: Not applicable
3.3 Chemical Formula: KI
3.4 IMCO United Nations Numerical Designation: None

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: White
4.3 Odor: Odorless

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Gloves, goggles
5.2 Symptoms Following Exposure: May be harmful if swallowed
5.3 Treatment for Exposure: Induce vomiting if swallowed
5.4 Toxicity by Inhalation (Threshold Limit Value): None
5.5 Short-Term Inhalation Limits: None
5.6 Toxicity by Ingestion: Harmful if swallowed
5.7 Late Toxicity: Data lacking
5.8 Vapor (Gas) Irritant Characteristics: None
5.9 Liquid or Solid Irritant Characteristics: None
5.10 Odor Threshold: None

6 FIRE HAZARDS

6.1 Flash Point: None
6.2 Flammable Limits in Air: None
6.3 Fire Extinguishing Agents: None
6.4 Fire Extinguishing Agents Not to be Used: None
6.5 Special Hazards of Combustion Products: None
6.6 Behavior in Fire: None
6.7 Ignition Temperature: None
6.8 Electrical Hazard: None
6.9 Burning Rate: None

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: None
7.2 Reactivity with Common Materials: Corrosive to aluminum, copper, lead, mercury, and their alloys
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: None

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data lacking
8.2 Waterfowl Toxicity: Data lacking
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

None
Not available from U.S. producers
Mallinckrodt, Inc.
St. Louis, MO
Hall Laboratories, Inc.
Pittsburgh, PA
Merck & Co., Inc.
Rahway, NJ
Mallinckrodt, Inc.
Paris, KY
Pfizer, Inc.
New York, NY
Stauffer Chemical Co.
Westport, CT

10 SHIPPING INFORMATION

10.1 Grades or Purity: USP, NF, FCC
10.2 Storage Temperature: None
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

See Note Hazard Assessment Handbook Page 446

SS

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Not listed
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 166.01
13.3 Boiling Point at 1 atm: Very high
13.4 Freezing Point: 1258°F = 681°C = 954°K
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 3.13 at 15°C (solid)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

Continued on page 444.5

NOTES

PTS

POTASSIUM OXALATE

Common Synonyms			
Potassium oxalate monohydrate	Solid	White	Odorless
	Sinks and mixes with water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning. Isolate contaminated area.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Potassium oxalate monohydrate

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula:** $K_2C_2O_4 \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color:** Colorless

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved respirator, chemical safety goggles, rubber gloves, rubber boots, and rubber clothing.

5.2 **Symptoms Following Exposure:** Inhalation of dust can cause irritation to the nose and throat. Ingestion can cause burning pain in the throat, esophagus, and stomach, corrosion of these membranes, nausea, vomiting, severe prostration, weak pulse and cardiovascular collapse may occur. Death may occur from neuromuscular symptoms developing. Contact with eyes may cause irritation.

5.3 **Treatment for Exposure:** For victims of INHALATION remove victim from further exposure. Give artificial respiration if victim is not breathing. If victim is conscious and not severely prostrated give 1 tbsp. calcium lactate in a glass of water. Repeat in a few minutes. For large amounts of dust, do not induce vomiting. Have victim rinse mouth with water, then drink 1 or 2 glasses of water. Call a physician immediately. If victim is conscious and not severely prostrated, induce vomiting by touching back of throat with finger or by giving a tablespoonful of mustard in a glass of warm water. Repeat until vomit fluid is clear. Do not induce vomiting or give anything by mouth to an unconscious person. Call a physician immediately. For victims of EYE CONTACT flush eyes with water for 15 minutes. Call a physician. For victims of SKIN CONTACT wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** Not established. Moderately toxic.

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point** Not applicable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products.**

6.6 **Behavior in Fire** Not flammable. Exposed containers may rupture from the heat of fire.

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Not reactive

7.2 **Reactivity with Common Materials**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Pfizer Chemicals Div.
New York, N.Y.

J. T. Baker Chemical Co.
Phillipsburg, N.J.

Stauffer Chemical Co.
Mineola, N.Y.

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Not required

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poison Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 184.24

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.13 at 15°C

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

NOTES

PTP	POTASSIUM PERMANGANATE

Common Synonyms	Solid crystals Dark purple Odorless Sinks and mixes slowly with water
Fire	Not flammable Containers may explode in fire May cause fire and explosion on contact with combustibles
Exposure	SOLID Irritating to skin and eyes If swallowed will cause severe vomiting or loss of consciousness
	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Initial warning - water pollutant fish
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Not commonly known
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $KMnO_4$
3.4 **IMCO United Nations Numerical Designation:** 1490

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Dark purple
4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Gloves, boots, apron, face shield
5.2 **Symptoms Following Exposure:** Burns skin and eyes. Harmful if swallowed
5.3 **Treatment for Exposure:** INGESTION: induce vomiting. Have victim drink large amounts of water. Get medical attention. EYES: Flush with water for 15 minutes
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not available
5.5 **Short-Term Inhalation Limits:** Not available
5.6 **Toxicity by Ingestion:** Moderately toxic
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** Corrosive to skin and eyes
5.10 **Odor Threshold:** Not applicable

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Flood with water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** May cause fire on contact with combustibles. Containers may explode
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not applicable
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Will explode on contact with rubber and many plastics. May cause ignition of wood. Some metals will react violently with concentrated solutions of permanganate
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 24 ppm 48 h Bluegill 11 mg/l freshwater
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Carus Chemical Inc.
   La Salle, Illinois
2. Harshaw Chemical Corp.
   1945 Madison Ave.
   New York, N.Y. 10035
3. Mallinckrodt Chemical Works
   Industrial Chemicals Division
   2nd and Mallinckrodt Sts.
   St. Louis, Missouri

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** USP, Reagent, Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

OX

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 158.04
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** Decomposes
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.7 at 15°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(continued on next page)

NOTES

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POP

POTASSIUM PEROXIDE

Common Synonyms			
Potassium superoxide	Solid (powder)	Yellow	Odorless
	Sinks and mixes violently with water		

Fire

Not flammable
Will increase the intensity of a fire
May cause fire on contact with combustibles

Exposure

DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Will burn skin and eyes.
If swallowed will cause nausea

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning oxidizing material
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Potassium superoxide
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula.** K_2O_4
3 4 **IMCO/United Nations Numerical Designation:** 5 1, 1491

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Powder
4 2 **Color:** Yellow
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure.** Inhalation causes respiratory irritation Ingestion causes severe burns of mouth and stomach Contact with eyes or skin causes irritation and caustic burns
5 3 **Treatment for Exposure:** INHALATION remove from exposure support respiration
INGESTION give large amount of water do NOT induce vomiting get medical attention
EYES irrigate with large quantities of water for at least 15 min get medical attention for caustic burns SKIN flush with water, treat caustic burns
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents:** Flood with water from a protected area
6 4 **Fire Extinguishing Agents Not to be Used.** A small amount of water may cause explosions
6 5 **Special Hazards of Combustion Products.**
6 6 **Behavior in Fire:** Increases intensity of fire and can start fires when in contact with organic combustibles
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Reacts violently with liberation of heat and oxygen and the formation of caustic solution
7 2 **Reactivity with Common Materials:** Can form explosive and self igniting mixtures with wood or other combustible materials
7 3 **Stability During Transport:** Stable if kept dry
7 4 **Neutralizing Agents for Acids and Caustics:** Following reaction with water caustic formed can be flushed away with water and area rinsed with dilute acetic acid
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 50 ppm 24 hr mosquitofish TL$_m$ fresh water
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

2 Ventron Inc
P O Box 159
Beverly Mass 01915

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial Pure
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

RR

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizing material solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight** 110
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** 914°F = 490°C = 763°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** > 1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution** Data not available
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5048-A

NOTES

PRP

PROPANE

Common Synonyms

Liquefied compressed gas. Colorless. Odorless—may have skunk odor added.

Liquid floats and boils on water. Flammable stable vapor cloud is produced.

Fire

FLAMMABLE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

SEE FORMULA AT TOP

VAPOR
Not irritating to eyes, nose or throat.
If inhaled, will cause dizziness, difficult breathing or loss of consciousness.

LIQUID
May cause frostbite.

DO NOT RUB AFFECTED AREA

Water Pollution

Not harmful to aquatic life.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook. CG 446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dimethylmethane

3 2 **Coast Guard Compatibility Classification:** Paraffin

3 3 **Chemical Formula:** $CH_3CH_2CH_3$

3 4 **IMCO/United Nations Numerical Designation:** 2.0 1075

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** Faint gassy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus for high concentrations of gas.

5 2 **Symptoms Following Exposure:** Vaporizing liquid may cause frostbite. Concentrations in air greater than 10% cause dizziness in a few minutes. Higher concentrations give the same effect in 10 min. High concentrations cause asphyxiation.

5 3 **Treatment for Exposure:** Remove to open air. If victim is overcome by gas, apply artificial respiration. Guard against self-injury if confused.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm

5 5 **Short-Term Inhalation Limits.** Data not available.

5 6 **Toxicity by Ingestion.** Not pertinent.

5 7 **Late Toxicity:** None.

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are not irritating to the eyes and throat.

5 9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard. Practically harmless to the skin because it evaporates quickly.

5 10 **Odor Threshold.** 5000 - 20,000 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** -156 F C C

6 2 **Flammable Limits in Air:** 2.1 - 9.5

6 3 **Fire Extinguishing Agents:** Stop flow of gas. For small fires use dry chemicals, CO2, halogenated agents, water spray.

6 4 **Fire Extinguishing Agents Not to be Used:** Water.

6 5 **Special Hazards of Combustion Products:** Not pertinent.

6 6 **Behavior in Fire:** Containers may explode. Vapor is heavier than air and may travel a long distance to source of ignition and flash back.

6 7 **Ignition Temperature:** 842 F

6 8 **Electrical Hazard:** Class I, Group D

6 9 **Burning Rate:** Not Given

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** None

8 2 **Waterfowl Toxicity.** None

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield
ARCO Chemical Co. Division
260 S. Broad St.
Philadelphia, Pa. 19101

2 Mobil Chemical Co.
North American Division
Beaumont, Texas 77704

3 Union Carbide Corp.
Linde Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity**

	%
Research	
Instrument	99.5+
Pure	
Technical	95-98

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook. CG 446-3)

ABCDEFG

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 44.09

13 3 **Boiling Point at 1 atm:**
-43.8°F = -42.1°C = 231.1°K

13 4 **Freezing Point:**
-305.8°F = -187.7°C = 85.5°K

13 5 **Critical Temperature:**
+152.01°F = +96.67°F = 370.82°K

13 6 **Critical Pressure:**
616.3 psia = 41.94 atm = 4.249 MN/m

13 7 **Specific Gravity:** 0.496 at -50°C (liquid)

13 8 **Liquid Surface Tension**
16 dynes/cm = 0.016 N/m at -42°C

13 9 **Liquid-Water Interfacial Tension**
(est.) 50 dynes/cm = 0.05 N/m at -50°C

13 10 **Vapor (Gas) Specific Gravity:** 1.5

13 11 **Ratio of Specific Heats of Vapor (Gas):**
1.130

13 12 **Latent Heat of Vaporization:** 183.2 Btu/lb
= 101.8 cal/g = 4.262 × 10⁵ J/kg

13 13 **Heat of Combustion:** -19,782 Btu/lb
= -10,990 cal/g = -460.13 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

PLT

beta-PROPIOLACTONE

Common Synonyms

beta Propiolactone
Betaprone
Propanolide
2 Oxetanone
Hydracrylic acid beta-lactone

Liquid | Colorless | Irritating odor

Mixes with water

Fire

Combustible
Containers may explode in fire

Exposure

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning: poison, water contaminant
Restrict access
Disperse and flush

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Betaprone, Hydracrylic acid, beta-lactone, 2 Oxetanone, Propanolide, beta Propiolactone

3 2 **Coast Guard Compatibility Classification:** Monomers (14)

3 3 **Chemical Formula** OCH_2CH_2CO

3 4 **IMCO/United Nations Numerical Designation:** 6 1

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent, acrid, irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air mask or organic canister mask, goggles or face shield, rubber gloves, protective clothing to prevent all contact with skin

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose, throat, and respiratory tract. Contact of liquid with eyes causes irritation and tears. Contact with skin causes irritation and blistering. Ingestion causes burns of mouth and stomach.

5 3 **Treatment for Exposure:** *Get medical attention following all exposures to this compound.* INHALATION: move victim to fresh air; if breathing has stopped, give artificial respiration. EYES: flush continuously with water for at least 15 min. SKIN: flush with water; if blistering occurs, alert physician to fact that fluid from blister will cause additional blistering of adjacent skin. INGESTION: give large amount of water and induce vomiting.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.0 ppm. Because of the high incidence of cancer either in man or animals, no exposure or contact by any route (respiratory, oral or skin) should be permitted.

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, oral LD[1] = 50 mg/kg (rat)

5 7 **Late Toxicity:** Because of the high incidence of cancer either in man or animals, no exposure or contact by any route (respiratory, oral or skin) should be permitted.

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.

5 9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes' contact.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 165 F C.C.

6 2 **Flammable Limits in Air:** 2.9% (LEL)

6 3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Vapors of unburned material are very toxic.

6 6 **Behavior in Fire:** Containers may explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Slow, non hazardous reaction to form beta hydroxy propionic acid

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Can polymerize and rupture container, especially at elevated temperatures. At 22 C, 0.04% polymerizes each day.

7 6 **Inhibitor of Polymerization:** None used

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Celanese Chemical Company
245 Park Avenue
New York, N Y 10017

2 Diamond Shamrock Chemical Corp
Nopco Chemical Division
Morristown, N J 07960

3 Eastman Kodak Co
Eastman Organic Chemicals
Rochester, N Y 14650

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** 97+%

10 2 **Storage Temperature:** Below 60 F

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous liquid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemical	3
Water	0
Self Reaction	

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 72.1

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** −28.1 F = −33.4 C = 239.8 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.146 at 20 C (liquid)

13 8 **Liquid Surface Tension** (est.): 22 dynes/cm = 0.022 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension** (est.): 25 dynes/cm = 0.025 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity:** 2.5

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.1089

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** 8,540 Btu/lb = 4.730 cal/g = 198 × 10[5] J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Data not available

Continued on pages 5 and 6

NOTES

PAD	PROPIONALDEHYDE

Common Synonyms
Propionaldehyde
Propionic aldehyde
Methyl acetaldehyde
Propanal
Propylic aldehyde

Liquid Colorless Suffocating unpleasant odor

Floats and mixes slowly with water Flammable irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause nausea or vomiting

LIQUID
Irritating to skin and eyes
Harmful if swallowed

IN EYES

Water Pollution

Effect of low concentrations on marine life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4)

Issue warning - high flammability
Evacuate area

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Methylacetaldehyde, Propaldehyde, Propanal, Propionic aldehyde, Propylaldehyde

3 2 **Coast Guard Compatibility Classification** Aldehyde

3 3 **Chemical Formula:** C_3H_6O

3 4 **IMCO United Nations Numerical Designation:** 3 2 1275

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent, unpleasant, suffocating

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air supplied mask for high vapor concentrations, plastic gloves, goggles

5 2 **Symptoms Following Exposure:** Vapors will irritate eyes and throat and has caused nausea and vomiting. Liquid causes severe irritation

5 3 **Treatment for Exposure** INHALATION remove victim to fresh air, if not breathing give artificial respiration, if breathing is difficult call a physician EYES flush with plenty of water for at least 15 minutes and call a physician SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 LD$_{50}$ 0.5 to 5 g/kg rat

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapor causes moderate irritation with tearing of eyes and high concentrations cause pulmonary edema. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Repeated or prolonged contact may cause defatting of the skin, which may lead to dermatitis

5 10 **Odor Threshold**

6 FIRE HAZARDS

6 1 **Flash Point** −22°F (−30°C)

6 2 **Flammable Limits in Air** 2.6% to 17.1%

6 3 **Fire Extinguishing Agents** Carbon dioxide or dry chemical for small fires, alcohol type foam for large fires

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to source of ignition and flash back

6 7 **Ignition Temperature** 405°F (207°C)

6 8 **Electrical Hazard** Not applicable

6 9 **Burning Rate.** 4.4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** May occur in presence of acids or caustics

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 95% of theoretical in 5 days

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Eastman Kodak Co
Texas Eastman Co Division
Longview, Tex 75601

2 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 97, 99%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting.** Open, flame arrester, pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

A-P-Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Toxicity	2
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight.** 58.08

13 3 **Boiling Point at 1 atm:** 119.4°F = 48.6°C = 321.2°K

13 4 **Freezing Point.** −124°F = −81.6°C = 191.5°K

13 5 **Critical Temperature:** 433°F = 223°C = 496°K

13 6 **Critical Pressure:** 690 psia = 47 atm = 4.8 MN/m²

13 7 **Specific Gravity:** 0.805 at 20°C (liquid)

13 8 **Liquid Surface Tension** 23.4 dynes/cm = 0.0234 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** 29 dynes/cm = 0.029 N/m at 22.7°C

13 10 **Vapor (Gas) Specific Gravity:** 2.0

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.12+

13 12 **Latent Heat of Vaporization** 214 B.t.u./lb = 119 cal/g = 4.90 × 10⁵ J/kg

13 13 **Heat of Combustion:** −12 470 B.t.u./lb = −6930 cal/g = −290.1 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (est.) 9 Btu/lb = 5 cal/g = 0.2 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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PNA	# PROPIONIC ACID

Common Synonyms
Propanoic acid
Ethanecarboxylic acid

Liquid Colorless Sharp rancid odor

Mixes with water. Irritating vapor is produced.

Fire

Combustible

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Dispense and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ethanecarboxylic acid
Methylacetic acid
Propanoic acid

3.2 **Coast Guard Compatibility Classification:** Organic acid

3.3 **Chemical Formula:** CH_3CH_2COOH

3.4 **IMCO United Nations Numerical Designation:** NO 1848

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp irritating slightly pungent rancid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask for high vapor concentrations. Plastic gloves, goggles or face shield.

5.2 **Symptoms Following Exposure:** Liquid causes skin and eye burns. Vapors may irritate eyes, nose and throat, but should not cause systemic illness.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN OR EYE CONTACT: immediately flush with plenty of water for at least 15 minutes; get medical care for eyes. Remove contaminated clothing.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 2.6 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause mild eye irritation such that a normal individual can detect high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics.** Liquid severely irritates skin, causes pain and second degree burns after a few minutes' contact.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 134°F (57°C) (ASTM D 56)

6.2 **Flammable Limits in Air:** 2.9% (calc.) 14.8% (est.)

6.3 **Fire Extinguishing Agents:** Water, carbon dioxide, dry chemical or alcohol foam

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 1105°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.2 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Corrodes ordinary steel and many other metals, but reaction is not hazardous

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, then neutralize with lime or soda ash

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** >1000 mg/l/48 hr/goldfish/Lafayette, IN/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0.5 g/g/5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Corp
Celanese Chemical Co
245 Park Ave
New York, N.Y. 10017

2. Eastman Kodak Co
Tennessee Eastman Co. Division
Kingsport, Tenn. 37662

3. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, 445.1)

VPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Corrosive Material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Heath	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 74.08

13.3 **Boiling Point at 1 atm:** 286.4°F = 141.3°C = 414.5°K

13.4 **Freezing Point:** -3.5°F = -20°C = 252.9°K

13.5 **Critical Temperature:** 642°F = 339°C = 612°K

13.6 **Critical Pressure:** 770 psia = 52.37 atm = 5.307 MN/m²

13.7 **Specific Gravity:** 0.995 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 26.2 dynes/cm = 0.0262 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.101

13.12 **Latent Heat of Vaporization:** 248 Btu/lb = 138 cal/g = 5.78 × 10⁵ J/kg

13.13 **Heat of Combustion:** −8,083 Btu/lb = −4,935 cal/g = −206.6 × 10⁵ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5-445.1

NOTES

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PAH — PROPIONIC ANHYDRIDE

Common Synonyms

Methylacetic anhydride
Propanoic anhydride
Propionyl oxide

Liquid | Colorless | Sharp odor

Sinks and mixes slowly with water

Fire

Combustible

Exposure

LIQUID
Will burn skin and eyes.
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning corrosive
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Methylacetic anhydride Propanoic anhydride Propionyl oxide

3 2 **Coast Guard Compatibility Classification:** Organic anhydride

3 3 **Chemical Formula:** (CH3CH2CO)2O

3 4 **IMCO/United Nations Numerical Designation:** 8

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic canister mask goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure.** Inhalation causes irritation of eyes and respiratory tract Contact with liquid causes burns of eyes and skin Ingestion causes burns of mouth and stomach

5 3 **Treatment for Exposure:** INHALATION move victim to fresh air if breathing has stopped give artificial respiration EYES immediately flush with plenty of water for at least 15 min get medical attention SKIN immediately flush with plenty of water for at least 15 min INGESTION give large amount of water, do NOT induce vomiting

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD50 to 15 g kg Grade 2 LD50 to 5 g kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting on skin and first degree burns on short exposure may cause second-degree burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 156 F OC 148 F CC

6 2 **Flammable Limits in Air:** 1.46 - 11.9

6 3 **Fire Extinguishing Agents:** Water dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 548 F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 3.0 mm min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly to form weak propionic acid the reaction is not hazardous

7 2 **Reactivity with Common Materials.** Slowly corrosive if wet

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water rinse with sodium bicarbonate or lime solution

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 50 ppm 48 hr water flea TLm fresh water
188 ppm 24 hr bluegill TLm fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** 1.41 lb 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York N Y 10017

2 Eastman Chemical Products Inc
Kingsport Tenn 37662

3 Pfizer Inc
509 Madison Avenue
New York N Y 10022

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 97+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 2)

NOXY

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	
Liquid or Solid Irritant	2
Poisons	
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (blue)	2
Flammability (Red)	2
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 130.1

13 3 **Boiling Point at 1 atm:** 336°F = 169°C = 442°K

13 4 **Freezing Point:** -45°F = -43°C = 230°K

13 5 **Critical Temperature:** 660°F = 349°C = 622°K

13 6 **Critical Pressure:** 590 psia = 41 atm = 3.3 MN m

13 7 **Specific Gravity:** 1.01 at 20°C (liquid)

13 8 **Liquid Surface Tension** 30 dynes cm = 0.030 N m at 25°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4.5

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.0043

13 12 **Latent Heat of Vaporization** 149 Btu lb = 83 cal g = 3.5 × 10^5 J kg

13 13 **Heat of Combustion:** (at 15°C) -10 320 Btu lb = -740 cal g = -2.40 × 10^6 J kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** (est) -36 Btu lb = -20 cal g = -0.84 × 10^5 J kg

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 4 and 5

NOTES

PAT

n-PROPYL ACETATE

Common Synonyms
Acetic acid n-propyl ester

Liquid | Colorless | Mild odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, dizziness or loss of consciousness.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning; high flammability.
Evacuate area.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic acid propyl ester
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** $CH_3COOCH_2CH_2CH_3$
3.4 **IMCO United Nations Numerical Designation:** 1.2.12%

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild ester

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Air-supplied mask in chemical cartridge respirator; shield; protective gloves.
5.2 **Symptoms Following Exposure:** Contact with skin and eyes causes irritation. High vapor concentrations will be irritating and will cause nausea, vomiting and dizziness, with final loss of consciousness.
5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air; give artificial respiration if breathing has stopped; give oxygen if breathing is difficult. SKIN: Wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5.5 **Short-Term Inhalation Limits.** 200 ppm for 60 min
5.6 **Toxicity by Ingestion:** Grade 3. LD$_{50}$: 3 g/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If left on skin and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 70 mg/m^3

6 FIRE HAZARDS

6.1 **Flash Point.** 55°F C.C. or 60°F O.C.
6.2 **Flammable Limits in Air:** 2.0% to 8.0%
6.3 **Fire Extinguishing Agents:** Carbon dioxide, water, dry chemical or regular foam or alcohol foam for large fires.
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
6.5 **Special Hazards of Combustion Products:** None known.
6.6 **Behavior in Fire:** No change.
6.7 **Ignition Temperature:** 842°F
6.8 **Electrical Hazard:** No data.
6.9 **Burning Rate:** Data not available.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 520 ppm/24 hr/brine shrimp/TL$_m$
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)**
62% of theoretical in 5 days/freshwater
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Div.
245 Park Ave.
New York, N.Y. 10017
2. Eastman Kodak Co.
Tennessee Eastman Co. Div.
Kingsport, Tenn. 37662
3. Union Carbide Corp.
Chemical and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 90, 98%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

A P Q-T-U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 102.13
13.3 **Boiling Point at 1 atm:**
215.9°F = 101.6°C = 374.8 K
13.4 **Freezing Point.**
-196°F = -126.0°C = 147.2 K
13.5 **Critical Temperature:**
537°F = 276°C = 549 K
13.6 **Critical Pressure:**
588 psia = 40 atm = 4.1 MN/m^2
13.7 **Specific Gravity:** 0.887 at 20°C/4°C
13.8 **Liquid Surface Tension.**
24 dynes/cm = 0.024 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:**
Data not available
13.10 **Vapor (Gas) Specific Gravity:**
No pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.073
13.12 **Latent Heat of Vaporization**
148 Btu/lb = 82.2 cal/g = 344 J/kg
13.13 **Heat of Combustion.**
Data not available
13.14 **Heat of Decomposition:** No pertinent
13.15 **Heat of Solution:** No pertinent
13.16 **Heat of Polymerization:** No pertinent

(Continued on next page)

NOTES

REVISED 1978

PAL

n-PROPYL ALCOHOL

Common Synonyms
Propyl alcohol
1-Propanol

Liquid | colorless | Alcohol odor

Mixes with water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, dizziness or headache.

LIQUID
Will burn eyes.
Harmful if swallowed.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning. High flammability.
Dike and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** 1-Propanol
1-Propanol
Propyl alcohol

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $CH_3CH_2CH_2OH$

3.4 **IMCO United Nations Numerical Designation:** 12 1274

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Resembles that of ethyl alcohol

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air-supplied respirator for high concentrations; goggles or face shield; plastic gloves.

5.2 **Symptoms Following Exposure:** Contact with eyes vapor causes burning and may cause burns. Vapor irritates nose and throat. In high concentrations, may cause nausea, dizziness, headache and stupor.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; call physician. SKIN OR EYE CONTACT: flush at once with plenty of water; get medical care for eyes.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm

5.5 **Short-Term Inhalation Limits.** 400 ppm for 30 min.

5.6 **Toxicity by Ingestion:** Grade 2. Dangerous if taken.

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes eye burning. Exposure to vapor at concentrations greatly exceeding the TLV may cause lung damage. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to skin.

5.10 **Odor Threshold:** 30 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 59°F (O.C.) 77°F (C.C.)

6.2 **Flammable Limits in Air:** 2.1% - 13.5%

6.3 **Fire Extinguishing Agents.** Carbon dioxide or dry chemical for small fires; alcohol foam for large fires.

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective.

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 700°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate.** 2.9 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 500 ppm/ 24 hr/ goldfish/ died/ fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** 0.47 LSlb lb/ 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Celanese Chemical Co.
245 Park Ave
New York, N.Y. 10017
2. Eastman Kodak Co.
Texas Eastman Co. Division
Longview, Tex. 75601
3. Union Carbide Corp.
Chemicals & Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99% +

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement.

10.4 **Venting:** Open (flame arrester).

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

VPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.** Not rated

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 60.10

13.3 **Boiling Point at 1 atm:** 207.0°F = 97.2°C = 370.4°K

13.4 **Freezing Point:** -196.2°F = -126.2°C = 147.0°K

13.5 **Critical Temperature:** 508.3°F = 264.6°C = 537.8 K

13.6 **Critical Pressure:** 750 psia = 51 atm = 4.2 MN/m²

13.7 **Specific Gravity:** 0.803 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.1

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.187

13.12 **Latent Heat of Vaporization:** 292.7 Btu/lb = 162 cal/g = 6.8 × 10⁵ J/kg

13.13 **Heat of Combustion:** -14,430 Btu/lb = -7986 cal/g = -33.4 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (ca) = 0 Btu/lb = 0 cal/g = 0.2 × 10⁶ J/kg

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

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PPL	# PROPYLENE

Common Synonyms
Propene
Methylethylene

Liquefied compressed gas — Colorless — Mild odor

Floats and boils on water. Flammable visible vapor cloud is produced.

Fire

FLAMMABLE
Container may explode in fire
Flashback along vapor trail may occur
May explode if ignited in an enclosed area

Exposure

VAPOR
If inhaled will cause dizziness or loss of consciousness

LIQUID
Will cause frostbite

Water Pollution

Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Isolate hazard area. High flammability. Evacuate area.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Methylethylene
Propene

3 2 **Coast Guard Compatibility Classification:** Group

3 3 **Chemical Formula:** $CH_3CH{=}CH_2$

3 4 **IMCO United Nations Numerical Designation:** 2.1/1077

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied gas

4 2 **Color:** Colorless

4 3 **Odor:** Mild odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor canister or air supply, self-contained breathing apparatus should be used for escape. Chemical goggles.

5 2 **Symptoms Following Exposure:** Moderate concentrations cause dizziness and unconsciousness. Contact with liquid may cause frostbite.

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. If breathing has stopped, start resuscitation. give oxygen as indicated.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Unknown

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Not pertinent

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are mildly irritating when concentrated.

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Prolonged contact may cause frostbite.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** −162.2°C

6 2 **Flammable Limits in Air:** 2.0 - 11

6 3 **Fire Extinguishing Agents.** Stop flow of gas

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Containers may explode. Vapor is heavier than air and can travel considerable distance. Flashback ignition and flashback.

6 7 **Ignition Temperature:** 497°C

6 8 **Electrical Hazard:** Class I Group D

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

2 [illegible] Chemical Co.
Houston, Texas 77001

[illegible] and Co.
Chemicals and Plastics Division
2500 Park Ave.
New York, N.Y. [illegible]

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Chemical 92+ polymer (propylene content 99.5+ percent) research 99+ percent concentration 99+

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook Section

A B C D E F G

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Toxicity	0
Liquid or Solid Toxicity	0
Poisons	
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effects	0
Reactivity	
with Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 42.08

13 3 **Boiling Point at 1 atm:**
−53.9°F = −47.7°C = 225.5 K

13 4 **Freezing Point:**
−301.4°F = −185.2°C = 88.0 K

13 5 **Critical Temperature:**
197.2°F = 91.8°C = 365.0 K

13 6 **Critical Pressure:**
670 psia = 45.6 atm = 4.62 MN/m²

13 7 **Specific Gravity:** 0.5139 at 20°C (Gas)

13 8 **Liquid Surface Tension:**
0.0 dynes/cm = 0.0 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 1.4

13 11 **Ratio of Specific Heats of Vapor (Gas).**
1.152

13 12 **Latent Heat of Vaporization:**
At Boiling Point = 435 = 10.1 kg

13 13 **Heat of Combustion.** −19,692 Btu/lb
= −9,840 cal/g = −412.0 kJ/g

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

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PBP	PROPYLENE BUTYLENE POLYMER

Common Synonyms	Liquid
Fire	Fire data not available
Exposure	Exposure data not available
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Data not available

2. LABELS

No hazard label required by U.S. Federal Regulations

3 CHEMICAL DESIGNATIONS

- 3.1 Synonyms: Not available
- 3.2 Coast Guard Compatibility Classification: Olefin
- 3.3 Chemical Formula: Not applicable
- 3.4 IMCO United Nations Numerical Designation: Not listed

4 OBSERVABLE CHARACTERISTICS

- 4.1 Physical State (as shipped): Liquid
- 4.2 Color: Data not available
- 4.3 Odor: Data not available

5 HEALTH HAZARDS

- 5.1 Personal Protective Equipment: Data not available
- 5.2 Symptoms Following Exposure: Data not available
- 5.3 Treatment for Exposure: Data not available
- 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available
- 5.5 Short Term Inhalation Limits: Data not available
- 5.6 Toxicity by Ingestion: Data not available
- 5.7 Late Toxicity: Data not available
- 5.8 Vapor (Gas) Irritant Characteristics: Data not available
- 5.9 Liquid or Solid Irritant Characteristics: Data not available
- 5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

- 6.1 Flash Point: Data not available
- 6.2 Flammable Limits in Air: Data not available
- 6.3 Fire Extinguishing Agents: Data not available
- 6.4 Fire Extinguishing Agents Not to be Used: Data not available
- 6.5 Special Hazards of Combustion Products: Data not available
- 6.6 Behavior in Fire: Data not available
- 6.7 Ignition Temperature: Data not available
- 6.8 Electrical Hazard: Data not available
- 6.9 Burning Rate: Data not available

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: No reaction
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not applicable
- 7.5 Polymerization: Not applicable
- 7.6 Inhibitor of Polymerization: Not applicable

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Arco Chemical Co.
Commodity Chemicals Division
Box 1346
Houston, Texas 77001

Amoco Chemicals Corp.
200 East Randolph Drive
Chicago, Illinois 60601

Exxon Chemical Co., U.S.A.
P.O. Box 3272
Houston, Texas 77001

10 SHIPPING INFORMATION

- 10.1 Grades of Purity: Data not available
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

NFI

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: Not pertinent
- 13.3 Boiling Point at 1 atm: Varies
- 13.4 Freezing Point: Not pertinent
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: Data not available
- 13.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 13.9 Liquid-Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 70°C
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: (est.) -7,000 Btu/lb = -9800 cal/g = -400 x 10³ J/g
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

Recommended materials

NOTES

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PPG

PROPYLENE GLYCOL

Common Synonyms
1,2-Propanediol
1,2-Dihydroxypropane

Thick liquid | Colorless | Odorless

Mixes with water

Fire

Combustible

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD):
2.2% of theoretical in 5 days
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

Hercules Inc.
910 Market St.
Wilmington, Del. 19899

Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

NFQ

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
I	
II	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Plume	
Water Reactivity	
Human Toxicity	
Aquatic Toxicity	
No Rating	
Reactivity	
Fire Hazard	
Water	
No Rating	

12.3 NFPA Hazard Classification:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
369.1 K
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
Not pertinent
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

REVISED 1978

PME	PROPYLENE GLYCOL METHYL ETHER

Common Synonyms
1 Methoxy 2 propanol
Dowanol PM
Dowanol 33B

Liquid | Colorless | Mild odor

Mixes with water. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dowanol PM
Dowanol PM
Methoxy 2 propanol

3.2 **Coast Guard Compatibility Classification:**

3.3 **Chemical Formula:** $CH_3CH(OH)CH_2OCH_3$

3.4 **IMCO United Nations Numerical Designation:**

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:**

5.2 **Symptoms Following Exposure:** Liquid or vapor irritating to eyes, nose and throat

5.3 **Treatment for Exposure:** EYES: wash with water for at least 15 minutes. SKIN: remove contaminated clothing and wash skin with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):**

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:**

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation of the eyes and throat at 1000 ppm. Irritation may be severe at high concentrations and prolonged exposure.

5.9 **Liquid or Solid Irritant Characteristics:** Moderately irritating to eyes. Prolonged or repeated skin contact may cause defatting and dermatitis.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:**

6.2 **Flammable Limits in Air:**

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, water spray, foam

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:**

6.8 **Electrical Hazard:**

6.9 **Burning Rate:**

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:**

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:**

7.4 **Neutralizing Agents for Acids and Caustics:**

7.5 **Polymerization:**

7.6 **Inhibitor of Polymerization:**

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**

8.2 **Waterfowl Toxicity:**

8.3 **Biological Oxygen Demand (BOD):**

8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical

10.2 **Storage Temperature:**

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

NFPA

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

12.3 **NFPA Hazard Classifications:**

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:**

13.3 **Boiling Point at 1 atm:**

13.4 **Freezing Point:**

13.5 **Critical Temperature:**

13.6 **Critical Pressure:**

13.7 **Specific Gravity:**

13.8 **Liquid Surface Tension:**

13.9 **Liquid-Water Interfacial Tension:**

13.10 **Vapor (Gas) Specific Gravity:**

13.11 **Ratio of Specific Heats of Vapor (Gas):**

13.12 **Latent Heat of Vaporization:**

13.13 **Heat of Combustion:**

13.14 **Heat of Decomposition:**

13.15 **Heat of Solution:**

13.16 **Heat of Polymerization:**

NOTES

REVISED 1978

POX

PROPYLENE OXIDE

Common Synonyms
Methyloxirane
1, 2 Epoxypropane
Propene oxide

Liquid | Colorless | Sweet, alcohol odor

Mixes with water. Flammable, irritat[illegible] vapors produced

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose, and throat
If inhaled, will cause headache, nausea, vomiting, or loss of consciousness

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Evacuate area

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** 1,2 Epoxypropane
Methyloxirane
Propene oxide

3 2 **Coast Guard Compatibility Classification** Alkylene oxide

3 3 **Chemical Formula** CH_3CHCH_2O

3 4 **IMCO/United Nations Numerical Designation.** 3 1 1280

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Ethereal characteristic sweet alcoholic, like natural gas

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Air supplied mask; rubber or plastic gloves; vapor proof goggles

5 2 **Symptoms Following Exposure:** Inhalation may produce headache, nausea, vomiting, and unconsciousness; mild depression of central nervous system; lung irritation. Slightly irritating to skin but covered contact may cause burn. Very irritating to eyes

5 3 **Treatment for Exposure:** INHALATION: remove person to fresh air immediately, keep quiet and warm; call a physician; if breathing stops, start artificial respiration. SKIN OR EYE CONTACT: immediately flush with plenty of water for at least 15 min; immediately remove contaminated clothing; wash hands; [illegible] etc. to prevent confining product to skin; for eyes get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] to 5 gm/kg (rat)

5 7 **Late Toxicity.** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapor is moderately irritating such that personnel will not usually tolerate moderate or higher vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure

5 10 **Odor Threshold** 200 ppm

5. FIRE HAZARDS

6 1 **Flash Point** 35 [illegible] C = −20°F [illegible]

6 2 **Flammable Limits in Air:** 2 1 [illegible] 38 5

6 3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol or polymer foam for large fires

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Container may explode. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature** 869 F

6 8 **Electrical Hazard** Class I Group B

6 9 **Burning Rate** 4 3 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** May occur due to high temperatures, contamination with alkalies, aqueous acid, amines, and acidic alcohols

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 BASF Wyandotte Corp
Wyandotte, Mich 48192

2 Dow Chemical Co
Midland, Mich 48640

3 Oxirane Corp
120 Alexander St
Princeton, N J 08540

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 99 (must contain no acetylene)

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** Inerted

10 4 **Venting.** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q R S

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	1
Self Reaction	3

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 58 08

13 3 **Boiling Point at 1 atm**
93 72°F = 34 3°C = 307 5°K

13 4 **Freezing Point.**
−169 4°F = −111 9°C = 161 3°K

13 5 **Critical Temperature**
308 4°F = 209 1°C = 482 3°K

13 6 **Critical Pressure**
714 psia = 48 6 atm = 4 92 MN/m²

13 7 **Specific Gravity:** 0 830 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
24 5 dynes/cm = 0 0245 N/m at 15°C

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity** 2 0

13 11 **Ratio of Specific Heats of Vapor (Gas)**
1 133

13 12 **Latent Heat of Vaporization**
208 Btu/lb = 114 cal/g = 4 77 × 10⁵ J/kg

13 13 **Heat of Combustion.** −13,000 Btu/lb
= −7,221 cal/g = −302 3 × 10⁵ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** (est) 19 Btu/lb
= 11 cal/g = 0 45 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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PTT PROPYLENE TETRAMER

Common Synonyms
Dodecene (non-linear)
Tetrapropylene

Liquid Colorless

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Dodecene (nonlinear)
Tetrapropylene

3 2 **Coast Guard Compatibility Classification**
Oleon

3 3 **Chemical Formula** $C_{12}H_{24}$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield

5 2 **Symptoms Following Exposure.** No inhalation hazard expected. Aspiration hazard if ingested. Low skin and eye irritation

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air. INGESTION do NOT lavage or induce vomiting; give aspirin, oil and demulcents; call physician. EYES flush with water for 15 min. SKIN wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 200 ppm

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade 0 LD$_{50}$ above 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 120 F (C.C.) 134 F (O.C.)

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents:** Water fog, foam, carbon dioxide, or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6 5 **Special Hazards of Combustion Products**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature.** 450 F (est.)

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Atlantic Refining Co.
ARCO Chemical Co. Division
260 S. Broad St.
Philadelphia, Pa. 19101

2 Continental Oil Co.
Conoco Chemicals Division
Park 80 Plaza East
Saddle Brook, N. J. 07662

3 Sun Oil Co.
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98 % +

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	*
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** 168.31

13 3 **Boiling Point at 1 atm:**
365–385 F = 185–196 C = 458–469 K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure.**
Not pertinent

13 7 **Specific Gravity:** 0.2937 at 20°C (liquid)

13 8 **Liquid Surface Tension** 23.9 dynes/cm
= 0.0239 N/m at 24°C

13 9 **Liquid-Water Interfacial Tension**
44.5 dynes/cm = 0.0445 N/m at 22.7°C

13 10 **Vapor (Gas) Specific Gravity**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization** (est.)
154 Btu/lb = 58.6 cal/g = 2.45×10^5 J/kg

13 13 **Heat Combustion.** -19,100 Btu/lb
= -10 600 cal/g = -444×10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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PII

PROPYLENEIMINE, INHIBITED

Common Synonyms

Propyleneimine
2 Methylaziridine
2 Methylethyleneimine

Liquid | Colorless | Strong ammonia like odor

Mixes with water. Flammable, irritating vapor is produced

[illegible]

Fire

FLAMMABLE
Irritating gases are produced when heated
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause nausea, vomiting or difficult breathing

[illegible]

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes.

[illegible]

IF SWALLOWED [illegible]

DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning: high flammability, water contaminant, air contaminant
Restrict access
Evacuate area
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2 Methylaziridine, 2 Methylethylenimine, Propyleneimine
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** CH_3CHCH_2NH
3 4 **IMCO/United Nations Numerical Designation.** 3 2/1921

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Strong ammonia like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Self-contained breathing apparatus, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure.** Inhalation causes vomiting, breathing difficulty, and irritation of eyes, nose, and throat; on prolonged exposure, vapors tend to redden the whites of the eyes. Contact with liquid causes eye irritation, like that caused by strong ammonia. Liquid causes skin burns, which are slow to heal. Ingestion causes burns of mouth and stomach.

5 3 **Treatment for Exposure.** INHALATION: move victim to fresh air, if he is not breathing, apply artificial respiration, oxygen if breathing is difficult, administer oxygen, call physician. EYES: flush with plenty of water for at least 30 min. and obtain prompt medical attention. SKIN: remove all contaminated clothing and flush with water, rinse with vinegar and water. INGESTION: drink large amounts of milk or water, get prompt medical attention.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 19 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 25°F O C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may be ineffective

6 5 **Special Hazards of Combustion Products:** Irritating nitrogen oxides are produced

6 6 **Behavior in Fire:** Containers may explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 4 1 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly to form propanolamine. The reaction is not hazardous

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable if kept in contact with solid caustic soda (sodium hydroxide)

7 4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, rinse with vinegar

7 5 **Polymerization:** Polymerizes explosively when in contact with any acid

7 6 **Inhibitor of Polymerization:** Solid sodium hydroxide (caustic soda)

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Arsynco Incorporated
P O Box 8
Carlstadt N J 07072

2 Polysciences Inc
Paul Valley Industrial Park
Warrington Pa 18976

3 Pfaltz and Bauer Inc
126-04 Northern Boulevard
Flushing N Y 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** Exclude air

10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A O P Q R-S-/

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 57 1

13 3 **Boiling Point at 1 atm:** 151°F = 66°C = 339°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 0 802 at 25°C (liquid)

13 8 **Liquid Surface Tension:** (est) 25 dynes/cm = 0 025 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 2

13 11 **Ratio of Specific Heats of Vapor (Gas)** Data not available

13 12 **Latent Heat of Vaporization.** 250 Btu/lb = 139 cal/g = 5 82 × 10⁵ J/kg

13 13 **Heat of Combustion:** (est) −15,500 Btu/lb = −8 600 cal/g = −360 × 10⁵ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** −140 Btu/lb = −78 cal/g = −3 3 × 10⁵ J/kg

13 16 **Heat of Polymerization:** (est) −720 Btu/lb = −400 cal/g = −17 × 10⁵ J/kg

Continued on pages 5 and 6

NOTES

PMN	# n-PROPYL MERCAPTAN

Common Synonyms

1 Propanethiol
Propane-1 thiol

Liquid Colorless Skunk like odor

Floats on water Flammable irritating vapor is produced

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
If inhaled will cause difficult breathing

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning high flammability
water contaminant air contaminant
restrict access evacuate area mechanical
containment should be removed
chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Propanethiol
Propane-1 thiol

3 2 **Coast Guard Compatibility Classification.**
Not applicable

3 3 **Chemical Formula:**
$CH_3CH_2CH_2SH$

3 4 **IMCO/United Nations Numerical Designation:** 3 1 1228

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor** Skunky

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield, rubber gloves self contained breathing apparatus or organic canister mask

5 2 **Symptoms Following Exposure.** Inhalation causes muscular weakness convulsions and respiratory paralysis high concentrations may cause pulmonary irritation Contact with liquid causes irritation of eyes and skin Ingestion causes irritation of mouth and stomach

5 3 **Treatment for Exposure:** INHALATION remove victim into air contaminated atmosphere give artificial respiration and oxygen if needed observe for premonitory signs of pulmonary edema EYES flush with water for 15 min if irritation persists see a physician SKIN flush with water wash with soap and water INGESTION induce vomiting and follow with gastric lavage

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 1 790 mg kg (rat)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold** 0 000 75 ppm

6 FIRE HAZARDS

6 1 **Flash Point** 5 F O C

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used**
Water may be ineffective

6 5 **Special Hazards of Combustion Products**
Toxic sulfur dioxide is generated

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard.** Data not available

6 9 **Burning Rate.** 3 1 mm min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Pennwalt Corporation
Chemicals Division
Three Parkway
Philadelphia Pa 19102

2 Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville Okla 74004

3 Aldrich Chemical Co
940 West St Paul Avenue
Milwaukee Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A T-U-V-W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 76 2

13 3 **Boiling Point at 1 atm:**
153°F = 67 C = 340°K

13 4 **Freezing Point:**
−171°F = −113°C = 160 K

13 5 **Critical Temperature:** (est)
495°F = 257°C = 530°K

13 6 **Critical Pressure.** (est)
667 psia = 45 3 atm = 4 60 MN m

13 7 **Specific Gravity:** 0 841 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
24 7 dynes/cm = 0 0247 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est)
18 dynes cm = 0 018 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity** 2 6

13 11 **Ratio of Specific Heats of Vapor (Gas)**
1 0984

13 12 **Latent Heat of Vaporization:** 179 Btu lb
= 99 cal/g = 4 16 × 10⁵ J kg

13 13 **Heat of Combustion:** 15 990 Btu lb
= 8 890 cal g = 372 × 10⁵ J kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

PRD

PYRIDINE

Common Synonyms

Liquid Colorless to yellow Sharp nauseating odor

Mixes with water. Poisonous flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
Poisonous if inhaled or if skin is exposed
Irritating to eyes, nose and throat

LIQUID
Poisonous if swallowed or if skin is exposed
Will burn eyes

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Isolate hazard area, deny entry
Remove source
Evacuate area
Dispose of liquid

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification** Aromatic amine
3 3 **Chemical Formula** C_5H_5N
3 4 **IMCO United Nations Numerical Designation:** 3 2 1282

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Yellow to colorless
4 3 **Odor:** Detectable at 5 to 12 ppm; unpleasant, characteristic, slightly pungent, sharp, somewhat fishy or ammoniacal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Air-supplied mask or organic vapor canister mask; protective gloves, rubber gloves and protective clothing

5 2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. Liquid irritates skin and is absorbed through skin. Overexposure causes nausea, headache, nervousness, pains, increased urine frequency

5 3 **Treatment for Exposure** INHALATION: Give individual plenty of fresh air. If not breathing, give artificial respiration and oxygen if necessary. Call physician immediately. INGESTION: Induce vomiting and follow with gastric lavage. SKIN: Wash thoroughly with large amounts of water. EYES: Flush with water for at least 15 minutes

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 5 ppm

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Grade 2 LD50 (oral, rat) 1 g/kg

5 7 **Late Toxicity:** Liver and kidney damage after ingestion

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor causes moderate eye irritation at 5 ppm for 5 minutes and high concentrations may cause corneal damage. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics** Causes severe irritation of the skin and liquid can cause burns on short exposure. Causes severe irritation on long exposure.

5 10 **Odor Threshold** 0.02 ppm

6 FIRE HAZARDS

6 1 **Flash Point** 68°F (20°C)
6 2 **Flammable Limits in Air.** LEL = 1.8 %
6 3 **Fire Extinguishing Agents** Alcohol foam, dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire** Vapor is heavier than air and may travel considerable distance to source of ignition and flash back
6 7 **Ignition Temperature.** 900°F (482°C)
6 8 **Electrical Hazard.** Class I, Group D
6 9 **Burning Rate.** 4.3 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** None
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 1350 mg/l 96-hr fish TLm (fresh water)
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD):** 1.1% 1.42 lb lb 5 day
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Koppers Co Inc
Organic Materials Division
Pittsburgh Pa 15219

2 Reilly Tar and Chemical Corp
1615 Merchants Bank Bldg
Indianapolis Ind 46204

Warner Lambert Co
Nepera Chemical Co Division
Harriman N Y 10926

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Technical, Pure
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

VPQRS

12. HAZARD CLASSIFICATIONS

12 1 ***Code of Federal Regulations:***
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight:** 79.10
13 3 **Boiling Point at 1 atm**
239.5°F = 115.3°C = 388.5°K
13 4 **Freezing Point:** −44°F = −42.0°C = 231°K
13 5 **Critical Temperature:**
656.2°F = 346.8°C = 620°K
13 6 **Critical Pressure**
827.3 psia = 55.6 atm = 5.63 MN/m²
13 7 **Specific Gravity:** 0.983 at 20°C (liquid)
13 8 **Liquid Surface Tension**
38.0 dynes/cm = 0.038 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:**
Not pertinent
13 10 **Vapor (Gas) Specific Gravity:**
2.73
13 11 **Ratio of Specific Heats of Vapor (Gas)**
1.123
13 12 **Latent Heat of Vaporization** 193 Btu/lb
= 107 cal/g = 4.48 × 10⁵ J/kg
13 13 **Heat of Combustion:** −14 300 Btu/lb
= −7992 cal/g = −334.6 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** (est.) −13 Btu/lb
= −7 cal/g = −0.3 × 10⁵ J/kg
13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

PGA PYROGALLIC ACID

Common Synonyms
Pyrogallol
1,2,3-Benzenetriol
1,2,3-Trihydroxybenzene

Solid | White to Gray | Odorless

Sinks and mixes with water

Fire

Combustible

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2,3-Benzenetriol
Pyrogallol 1,2,3-Trihydroxybenzene

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula** $C_6H_3(OH)_3$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color:** White to gray

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, safety goggles, dust mask

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion may cause severe gastrointestinal irritation, convulsions, circulatory collapse, and death. Contact with eyes causes irritation. Skin contact can cause local discoloration, irritation, eczema, and death; repeated contact can cause sensitization.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: give large amounts of water, induce vomiting immediately, consult a physician. EYES: flush with water for at least 15 min., consult a physician. SKIN: wash immediately with soap and water, consult a physician if exposure has been severe.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Grade 2; oral LD_{50} = 750 mg/kg (rats)

5.7 **Late Toxicity:** Depresses growth in chicks

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point.** Not pertinent (combustible solids)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature.** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1b ppm/48 hr/goldfish; 11 m/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 1.63, 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. The Harshaw Chemical Co
1945 East 97 St
Cleveland, Ohio 44106

2. Aldrich Chemical Co
940 W. Saint Paul Ave
Milwaukee, Wis. 53233

3. Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** N.F., Reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 126

13.3 **Boiling Point at 1 atm.:** 968°F = 309°C = 582°K

13.4 **Freezing Point:** 268°F = 131°C = 404°K

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.45 at 20 °C (solid)

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −9 140 Btu/lb = −5 070 cal/g = −212 × 10³ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

QNL

QUINOLINE

Common Synonyms
1 Benzazine
Benzopyridine
Chinoline
1 Azanaphthalene

Liquid | Colorless to brown | Strong unpleasant odor

Sinks in water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4)

Issue warning - water contaminant
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Azanaphthalene
1 Benzazine Benzopyridine
Chinoline Leucol

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** C_9H_7N

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless to brown

4 3 **Odor:** Strong unpleasant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U S Bu Mines approved vapor and chemical safety goggles face shield rubber gloves coveralls and rubber apron rubber shoes and boots

5 2 **Symptoms Following Exposure:** Vapors are irritating to nose and throat and may cause headaches dizziness, and nausea if inhaled Ingestion causes irritation of mouth and stomach vomiting may occur Contact with eyes or skin causes irritation

5 3 **Treatment for Exposure.** INHALATION remove victim to fresh air INGESTION give large amount of water induce vomiting get medical attention EYES flush immediately with plenty of water for at least 15 min , call physician SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 460 mg kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold.** 71 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 220 F C C

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents** Water dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used**

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire:** Heat exposure may cause pressure build up in closed containers

6 7 **Ignition Temperature:** 896 F

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate** 4 06 mm min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials.** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
52-56 ppm 96 hr sunfish/TL_m fresh water
5 ppm 96 hr trout TL_m fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 1 % 5 days

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Koppers Co Inc
Organic Materials Div
Koppers Bldg
Pittsburgh Pa 15219

2 Eastman Organic Chemicals
Rochester N Y 14650

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent
Technical

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

V T U X Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** 129

13 3 **Boiling Point at 1 atm:** 459°F = 237°C = 510 K

13 4 **Freezing Point** 5 F = -15 C = 258°K

13 5 **Critical Temperature.** 948°F = 509°C = 782°K

13 6 **Critical Pressure:** Data not available

13 7 **Specific Gravity:** 1 095 at 25 C (liquid)

13 8 **Liquid Surface Tension.** 43 0 dynes cm = 0 0430 N m at 20 C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4 5

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** (est)
155 Btu lb = 86 cal g
= 3 6 × 10⁵ J kg

13 13 **Heat of Combustion:** -15 700 Btu lb
= -8 710 cal g = -36 5 × 10⁶ J kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

RSC

RESORCINOL

Common Synonyms
1,3 Benzenediol
m-Dihydroxybenzene
Resorcin
1,3-Dihydroxybenzene
Dihydroxybenzol

Solid | White or off white | Faint odor

Sinks and mixes with water

Fire

Combustible
CONTAINERS MAY EXPLODE IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1,3 Benzenediol m-Dihydroxybenzene, 1,3 Dihydroxybenzene Dihydroxybenzol Resorcin

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** $C_6H_4(OH)_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White or nearly white

4 3 **Odor:** Faint characteristic aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U.S. Bu. Mines approved respirator, rubber gloves, safety glasses with side shields or chemical goggles, coveralls or rubber apron

5 2 **Symptoms Following Exposure:** Inhalation of vapors or dust causes irritation of respiratory tract. Ingestion causes burns of mucous membranes, severe diarrhea, pallor, sweating, weakness, headache, dizziness, tinnitus, shock, and severe convulsions; may also cause siderosis of the spleen and tubular injury to the kidneys. Contact with eyes causes irritation. Can be absorbed from wounds or through unbroken skin, producing severe dermatitis, methemoglobinemia, cyanosis, convulsions, tachycardia, dyspnea, and death.

5 3 **Treatment for Exposure.** INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration, preferably mouth-to-mouth; if breathing is difficult, give oxygen; call a physician. INGESTION: give activated charcoal slurry in water; gastric lavage with water; consult physician. EYES: flush with water for 15 min. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0.5 - 5 g/kg

5 7 **Late Toxicity:** Produces gonadal effects in rats

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

5 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may cause frothing

6 5 **Special Hazards of Combustion Products.**

6 6 **Behavior in Fire:** Containers may explode

6 7 **Ignition Temperature:** 1125°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
35 ppm * bleak and carp, toxic threshold, fresh water
96.4 ppm 48 hr daphnia TL$_m$ fresh water
* Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
0% 5 days

8 4 **Food Chain Concentration Potential.**
None

9. SELECTED MANUFACTURERS

1. Koppers Company, Inc.
Koppers Building
Pittsburgh, Pa. 15219

2. Eastman Organic Chemicals
Rochester, N.Y. 14650

3. Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** USP 99.5+%
Technical 99%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm**
Solid

13 2 **Molecular Weight:** 110.11

13 3 **Boiling Point at 1 atm.** (sublimes)
531°F = 277°C = 550°K

13 4 **Freezing Point:**
229°F = 109°C = 382°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.2 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:** −11 200 Btu/lb
= −6 200 cal/g = −259 × 10^3 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on next page)

NOTES

SLA — SALICYLIC ACID

Common Synonyms	Solid	White to light tan	Odorless
o-Hydroxybenzoic acid Retarder W	Sinks and mixes slowly with water		

Fire	Combustible Dust cloud may explode if ignited in an enclosed area Irritating gases may be produced when heated
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. If swallowed will cause vomiting
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** o-Hydroxybenzoic acid
Retarder W

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula:**
$C_6H_4(OH)COOH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** White to very light tan

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gloves, goggles, respirator for dust, clean body-covering clothing

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Vomiting may occur spontaneously if large amounts are swallowed. Contact with eyes causes irritation, marked pain and corneal injury which should heal. Prolonged or repeated skin contact may cause marked irritation or even a mild burn.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: induce vomiting and get medical attention promptly. EYES: promptly flush with water for 15 min. and get medical attention. SKIN: wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 2 LD$_{50}$ 0.5 - 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Irritating vapors of unburned material and phenol may form in fire

6 6 **Behavior in Fire:** Sublimes and forms vapor or dust that may explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 1 450 ppm/48 hr daphnia threshold for immob /fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD).** 141% 5 days

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Tennessee Chemicals Inc
Intermediates D
Turner Place
P O Box 42
Piscataway N J 08854

2 Monsanto Company
800 North Lindbergh Blvd
St Louis Mo 63166

3 Dow Chemical Co
Midland, Mich 48640

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99+%
Pure, 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Solid

13 2 **Molecular Weight:** 138 13

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:**
315°F = 157°C = 430°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 44 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization.**
Not pertinent

13 15 **Heat of Combustion:** −9 420 Btu/lb
= −5 230 cal/g = −219 × 10^3 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5A

NOTES

SLD	# SELENIUM DIOXIDE

Common Synonyms			
Selenium oxide Selenious anhydride	Solid	White	Sour odor
	Sinks and mixes with water		

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. If swallowed will cause coughing nausea or vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-2)

Issue warning. Isolate water contaminant
Restrict access
Disperse and flush

2 LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Selenious anhydride
Selenium oxide

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** SeO_2

3 4 **IMCO/United Nations Numerical Designation:** Not assigned

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Pungent sour

5 HEALTH HAZARDS

The compound is highly toxic if inhaled or ingested

5 1 **Personal Protective Equipment:** Dust mask, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure:** Absorption of selenium may be demonstrated by presence of the element in the urine and by a garlic like odor of the breath. Inhalation of dust can cause bronchial spasms, symptoms of asphyxiation and pneumonitis. Acute symptoms of exposure include sternal pain, cough, nausea, pallor, coated tongue, gastrointestinal disorders, pneumonia and convulsions. Contact with eyes causes irritation.

5 3 **Treatment for Exposure:** Consult physician after all exposures to this compound. INHALATION remove victim to fresh air, give oxygen if needed. INGESTION induce vomiting, follow with gastric lavage and saline cathartics. EYES flush immediately and thoroughly with water. SKIN flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg m^3 (as selenium)

5 5 **Short-Term Inhalation Limits:** 0.3 mg m^3 (30 min) (as selenium)

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** [illegible] mg m^3

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:**

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products.** Sublimes and forms toxic vapors when heated in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** In presence of water and corrodes most metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 12 ppm / Class goldfish / Flow / Fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 American Hoechst Corp
Somerville N J 08876

2 Ventron Div
P O Box 299
Beverly Mass 01915

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99%

10 2 **Storage Temperature:** Cool ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight.** 111

13 3 **Boiling Point at 1 atm:** Sublimes 1004°F = 315°C = 588°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 3.95 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** 12.1 Btu lb = 6 cal g = 6.28 × 10^3 J kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

STO

SELENIUM TRIOXIDE

Selenium anhydride

Solid White

Fire

Not flammable

Exposure

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause coughing nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - corrosive water system hazard
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Selenic anhydride
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** SeO_3
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** Data not available

5 HEALTH HAZARDS

The compound is a gas from decomposition heated

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure:** Absorption of selenium may be detected by presence of the element in the urine and by a garlic breath odor. Inhalation can cause bronchial spasms symptoms of gas poisoning and pneumonitis. Acute symptoms of ingestion include sternal pain cough nausea pallor coated tongue gastrointestinal disorders nervousness and convulsions. Contact with eyes can cause irritation.
5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air give oxygen if necessary. INGESTION induce vomiting follow with gastric lavage and saline cathartic. EYES flush immediately and thoroughly with water. SKIN flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (as selenium)
5 5 **Short-Term Inhalation Limits.** 0.3 mg/m³ (5 min) (as selenium)
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously with water to form selenic acid H_2SeO_4
7 2 **Reactivity with Common Materials:** Corrodes all metals when moisture is present
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water rinse with dilute solution of sodium bicarbonate soda ash
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

Gallard Schlesinger Chemical Mfg Co
and Mercer Ave
Carle Place N Y
2 Platz and Bauer Inc
Industrial Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial also shipped as a 40% solution in water (selenic acid)
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

RR

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 127
13 3 **Boiling Point at 1 atm:** Not pertinent decomposes
13 4 **Freezing Point:** 244°F = 118°C = 391°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 4.5 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 5

NOTES

STC SILICON TETRACHLORIDE

Common Synonyms			
Silicon chloride	Liquid	Colorless to light yellow	Suffocating odor
	Reacts violently with water. Irritating gas is produced on contact with water.		

Fire

Not flammable

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning. Corrosive air contaminant.
Restrict access.
Evacuate area.
Disperse and flush with water.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Silicon chloride
3.2 **Coast Guard Compatibility Classification:** To be developed
3.3 **Chemical Formula:** $SiCl_4$
3.4 **IMCO/United Nations Numerical Designation:** 1818

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Suffocating acid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid canister type gas mask or self-contained breathing apparatus; goggles or face shield; rubber gloves; other protective clothing to prevent contact with skin.

5.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory tract resulting in gasping, choking and a feeling of suffocation; continued inhalation may produce ulceration of the nose, throat and larynx; of inhaled deeply, edema of the lungs may occur. Contact of liquid with eyes causes severe irritation and possible burns may cause permanent visual impairment. Liquid may cause severe burns. Skin. Repeated skin contact with dilute solutions or gaseous fuming concentrated vapors may cause dermatitis. Ingestion causes severe internal burns with pain, shock, vomiting and collapse. Inhalation causes severe burning pain in throat, chest and abdomen, chest difficulties in swallowing, nausea, vomiting and diarrhea. In severe cases, collapse and unconsciousness may result.

5.3 **Treatment for Exposure:** Get medical attention. Take immediate steps to avoid contamination. INHALATION: remove victim from contaminated atmosphere. If breathing has ceased, start mouth-to-mouth resuscitation. Oxygen should only be administered by an experienced person when authorized by a physician. Keep patient warm and comfortable. EYES: immediately flush with large quantities of running water for a minimum of 5 min, continue irrigation for an additional 15 min if physician is not available. SKIN: immediately flush affected area with water. Severe or extensive burns may be caused by silicon tetrachloride, producing shock. Symptoms include rapid pulse, sweating and collapse; keep patient comfortable, warm. INGESTION: If patient is conscious, give large amounts of lime water or milk. Magnesia, plain water should be given. If neither of these is available, do NOT give soda, carbonate or make an attempt to induce vomiting. If patient is unconscious, do not give anything but ensure there is no obstruction to breathing; tongue should be kept forward and false teeth removed; he will be less likely to aspirate vomit if placed in a face-down position.

Continued on next page

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam on adjacent fires
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Contact with water or foam applied to adjacent fires will produce irritating fumes of hydrogen chloride
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently with water to evolve hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials:** In presence of moisture attacks most metals; the reaction is not violent
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water; rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Stauffer Chemical Company
Industrial Chemical Division
Westport, Connecticut

2. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

3. Diamond Shamrock Chemical Co.
1095 Cleveland Street
Morristown, N.J. 07960

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Technical 98%+
U.P. 99%+
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Dry air
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A43

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicants	4
Aquatic Toxicants	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 169.9
13.3 **Boiling Point at 1 atm.**
57.7°F = 14.3°C = 330°K
13.4 **Freezing Point:**
-94°F = -70°C = 203°K
13.5 **Critical Temperature:**
472°F = 233.6°C = 506°K
13.6 **Critical Pressure:**
542 psia = 36.9 atm = 3.74 MN/m²
13.7 **Specific Gravity:** 1.48 at 20°C (liquid)
13.8 **Liquid Surface Tension.**
(calculated) = 0.019 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 5.86
13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13.12 **Latent Heat of Vaporization:** 74.2 Btu/lb = 41.2 cal/g = 1.73 × 10⁵ J/kg
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -74.2 Btu/lb = -41.2 cal/g = -1.73 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

5 HEALTH HAZARDS (Cont'd)

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4 LD₅₀ <50 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. Eyes cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

SVA	# SILVER ACETATE

Common Synonyms	Solid	White to gray	Odorless
	Sinks in water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Isolate warning - water contaminant
Keep out of water
Dispersal and foam

2. LABELS

No hazard label required by Coast Guard
Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None commonly used
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** CH_3COOAg
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White to gray
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Dust mask, particle respirator, face shield, protective gloves
5.2 **Symptoms Following Exposure:** Inhalation of dust irritating to nose and throat. Contact with eyes will cause irritation. If contacted during period of exposure, chemical will react with moisture to cause permanent staining and skin damage
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water. Induce vomiting. EYES: flush with water for 15 min. SKIN: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]
[illegible]
[illegible]
[illegible]
P O Box [illegible]
[illegible]
[illegible]
[illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial Purified
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

HNS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 166.9
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.26 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

SVC SILVER CARBONATE

Common Synonyms	Solid	Yellow to brown	Odorless
	Sinks in water		

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compat** **Classification:** Not listed
3.3 **Chemical Formula:** Ag_2CO_3
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Yellow to brown
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** mask, particle or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Contact with eyes causes irritation. If continued for a long period ingestion or inhalation of silver compounds can cause permanent discoloration of the eyes, skin
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water, induce vomiting. EYES: flush with water. SKIN: flush with water, wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.01 mg/m³
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not applicable
6.4 **Fire Extinguishing Agents Not to be Used:** Not applicable
6.5 **Special Hazards of Combustion Products:** Not applicable
6.6 **Behavior in Fire:** Decomposes to metallic silver and carbon dioxide; the residue is not hazardous
6.7 **Ignition Temperature:** Not applicable
6.8 **Electrical Hazard:** Not applicable
6.9 **Burning Rate:** Not applicable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not applicable
7.5 **Polymerization:** Not applicable
7.6 **Inhibitor of Polymerization:** Not applicable

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. K & K Laboratories
   Plainview, L.I., N.Y. 11803
2. J. T. Baker Chemical Co.
   Phillipsburg, N.J. 08865
3. Ballard-Schlesinger Chemical Mfg. Co.
   144 Monroe Ave.
   Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **Fire hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 275.8
13.3 **Boiling Point at 1 atm:** Not applicable (decomposes)
13.4 **Freezing Point:** Not applicable
13.5 **Critical Temperature:** Not applicable
13.6 **Critical Pressure:** Not applicable
13.7 **Specific Gravity:** 6.08 (solid)
13.8 **Liquid Surface Tension:** Not applicable
13.9 **Liquid-Water Interfacial Tension:** Not applicable
13.10 **Vapor (Gas) Specific Gravity:** Not applicable
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not applicable
13.12 **Latent Heat of Vaporization:** Not applicable
13.13 **Heat of Combustion:** Not applicable
13.14 **Heat of Decomposition:** Not applicable
13.15 **Heat of Solution:** Not applicable
13.16 **Heat of Polymerization:** Not applicable

(Continued on next page)

NOTES

SVF SILVER FLUORIDE

Common Synonyms
Argentous fluoride
Silver monofluoride

Solid | Yellow to gray | Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea vomiting or loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

2 1 **Synonyms.** Argentous fluoride
Silver monofluoride
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula** AgF
3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color** Yellow to gray
4 3 **Odor.** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask goggles or face shield protective gloves
5 2 **Symptoms Following Exposure** Inhalation of dust causes irritation of nose and throat Ingestion may cause vomiting salty taste abdominal pain diarrhea convulsions collapse thirst disturbed vision and renal toxic nephritis Contact with eyes causes irritation Skin may be blackened on prolonged exposure
5 3 **Treatment for Exposure** INHALATION move to fresh air INGESTION get medical attention at once give large amount of water and induce vomiting EYES flush with water for at least 15 min SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.01 mg/m
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity.** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire**
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials**
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Ozark Mahoning Co
1870 South Boulder
Tulsa Okla 74119
2 Ventron Inc
P O Box 159
Beverly Mass 01915
3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10. SHIPPING INFORMATION

10 1 **Grades of Purity** Commercial
Pure 99 9% %
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

HSS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15 °C and 1 atm:** Solid
13 2 **Molecular Weight.** 126 9
13 3 **Boiling Point at 1 atm.** 2 118°F = 1 159°C = 1,432°K
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 5 82 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

SVI

SILVER IODATE

Common Synonyms	Solid	White	Odorless
	Sinks in water		

[illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes Harmful if swallowed [illegible] IF EYES are irritated, flush with plenty of water IF SWALLOWED and CONSCIOUS, induce VOMITING IF SWALLOWED [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning, water contaminant
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula** $AgIO_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure** Contact with eyes causes irritation. If continued for a long period ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria)
5 3 **Treatment for Exposure:** INHALATION move to fresh air. INGESTION give large amount of water, induce vomiting. EYES flush with water for at least 15 min. SKIN flush with water, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.01 mg/m³
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity.** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire**
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 [illegible]
690 Nanuet River Rd
Ardsley, N Y 10502
2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514
3 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford, Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99+%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 282 1
13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 5 53 at 4°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

SVN — SILVER NITRATE

Common Synonyms
Lunar caustic

Solid crystals | Colorless to grayish black | Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

SOLIDS
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning — water contaminant
Should be removed

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lunar caustic
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula** $AgNO_3$
3 4 **IMCO United Nations Numerical Designation:** UN 1493

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color** Colorless
4 3 **Odor** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure** Concentrated solutions will produce irritation ulceration and discoloration of the skin also causes severe irritation of the eyes Ingestion will produce violent abdominal pain and other gastrointestinal symptoms
5 3 **Treatment for Exposure** INGESTION Gastric lavage with dilute solution of sodium chloride followed by cathartics and demulcents Other treatment is symptomatic SKIN wash promptly
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion** Grade 3 LD_{50}: 500 mg/kg
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Not available
5 9 **Liquid or Solid Irritant Characteristics.** Burns skin on prolonged contact
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire** Increases flammability of combustibles
6 7 **Ignition Temperature.** Not flammable
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate.** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
0.44 mg/l 48 hr salmon fry decidedly toxic/ fresh water
0.0140 ppm * eparaxenurotus inhibit egg develop salt water
*Time period not specified
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Eastman Kodak Co
Eastman Organic Chemicals Division
Rochester N Y 14650

2 Engelhard Minerals and Chemicals Corp
Silver Products Dept
231 New Jersey Railroad Ave
Menlo Park N J 08817

3 Mallinckrodt Chemical Works
Industrial Chemicals Division
2nd and Mallinckrodt Sts
St Louis Mo 63160

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent 99.8%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

SN

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight** 169.87
13 3 **Boiling Point at 1 atm** Decomposes
13 4 **Freezing Point.** 414°F = 212°C = 485°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 4.35 at 19°C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on page 5-SN-A

NOTES

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SVO

SILVER O)..DE

Common Synonyms
Argentous oxide

Solid | Brown black | Odorless

Sinks in water

Fire

Not flammable

Exposure

DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Argentous oxide
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula:** Ag_2O
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Brownish black
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Contact with eyes causes mild irritation. Prolonged or long period ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria)
5 3 **Treatment for Exposure:** EYES flush with water SKIN flush with water, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.01 mg/m
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Grade 2 LD$_{50}$ 5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Decomposes into metallic silver and oxygen. If large quantities are involved, the oxygen might increase the intensity of the fire
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials**
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Pfaltz and Bauer, Inc.
375 Fairfield Ave
Stamford, Conn. 06902

2 Gallard-Schlesinger Chemical Mfg. Co.
584 Mineola Ave
Carle Place, N.Y. 11514

3 Fisher Scientific Co.
711 Forbes Ave
Pittsburgh, Pa. 15219

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight.** 231.8
13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 7.14 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

SVS

SILVER SULFATE

Common Synonyms	Solid	White to gray	Odorless
	Sinks and mixes with water		

[illegible]

Fire	Not flammable
Exposure	[illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Issue warning - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** Ag_2SO_4
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** White to gray
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure.** Contact with eyes causes irritation. If continued for a long period ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria)
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.01 mg/m
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials**
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 0.4 ppm/48 hr barnacles lethal/90% salt water
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 K S A Corporation
690 Saw Mill River Rd
Ardsley N Y 10502
2 J T Baker Chemical Co
Phillipsburg N J 08865
3 Ventron Inc
P O Box 159
Beverly Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Reagent, Commercial
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

HSS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight.** 311.80
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 5.45 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

SDU	SODIUM

Common Synonyms

Soft solid under kerosene Silver to grayish white Odorless

Floats and reacts violently with water. Flammable gas is produced.

AVOID CONTACT WITH SOLID. Keep upwind. Call fire department. Notify local health and pollution control agencies. Prevent runoff into drains, sewers or waterways.

Fire

FLAMMABLE
FIRE MAY START ON CONTACT WITH AIR
Flammable gas formed on contact with water or moisture.
Will explode spontaneously in air. Use no water. Use dry chemical, soda ash, lime or sand. Do not use water. Extinguish with dry powder, graphite, salt or other approved dry powder such as dry limestone.

Exposure

AVOID ANY PERSONAL CONTACT.
SOLID
Will burn skin and eyes.
Avoid contact with solid and dust. Wear protective clothing. Stay upwind.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials. Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Section 4 of Manual's Handbook, CG-446-4

Issue warning. High flammability.
Restrict access.
Evacuate area.
Chemical and physical treatment.

2 LABELS



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms.
3 2 **Coast Guard Compatibility Classification** Not applicable.
3 3 **Chemical Formula:** Na
3 4 **IMCO United Nations Numerical Designation:** 4 3 1428

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Soft solid or liquid.
4 2 **Color.** Silvery white, changing to gray on exposure to air.
4 3 **Odor:** Odorless.

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Maximum protective clothing, gloves and face shield.
5 2 **Symptoms Following Exposure** Severe burns caused by burning metallic base and caustic soda formed by reaction with moisture on skin.
5 3 **Treatment for Exposure** SKIN: Flush with water. Remove contaminated clothing. Treat as for heat and caustic burns. EYES: Flush with water. Call a doctor.
5 4 **Toxicity by Inhalation (Threshold Limit Value)** No pertinent.
5 5 **Short-Term Inhalation Limits:** No pertinent.
5 6 **Toxicity by Ingestion** No pertinent.
5 7 **Late Toxicity:** None.
5 8 **Vapor (Gas) Irritant Characteristics** None known.
5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and severe injuries to the eyes.
5 10 **Odor Threshold:** Not pertinent.

6 FIRE HAZARDS

6 1 **Flash Point** Not pertinent.
6 2 **Flammable Limits in Air** No pertinent.
6 3 **Fire Extinguishing Agents** Dry soda ash, graphite, salt or other approved dry powder such as dry limestone.
6 4 **Fire Extinguishing Agents Not to be Used** Water, carbon dioxide or halogenated extinguishing agents.
6 5 **Special Hazards of Combustion Products:** Fumes of burning Na are highly irritating to eyes, eyes and mucous membranes.
6 6 ***Behavior in Fire*** Not pertinent.
6 7 **Ignition Temperature** 250 F
6 8 **Electrical Hazard** Not pertinent.
6 9 **Burning Rate** Not pertinent.

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently with formation of flammable hydrogen gas and caustic soda solution. A fire often occurs.
7 2 **Reactivity with Common Materials** No reaction.
7 3 **Stability During Transport:** Stable.
7 4 **Neutralizing Agents for Acids and Caustics:** After reaction with water, caustic soda for mid-ranges diluted with water and then neutralized with acetic acid.
7 5 **Polymerization** Not pertinent.
7 6 **Inhibitor of Polymerization.** Not pertinent.

8 WATER POLLUTION

8 1 **Aquatic Toxicity** No pertinent.
8 2 **Waterfowl Toxicity.** Not pertinent.
8 3 **Biological Oxygen Demand (BOD)** None.
8 4 **Food Chain Concentration Potential** None.

9 SELECTED MANUFACTURERS

1 E I duPont de Nemours
Electrochemical Dept
Wilmington, Del 19898

2 Ethyl Corp
Industrial Chemicals Division
451 Florida
Baton Rouge, La 70801

3 RMI Company
State Rd
Ashtabula, Ohio 44004

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial grade, 99.9%
10 2 **Storage Temperature:** 240 - 250 F (should be ambient sound)
10 3 **Inert Atmosphere.** Dry nitrogen or argon (for liquid) under kerosene (for solid).
10 4 **Venting.** Pressure vacuum.

11 HAZARD ASSESSMENT CODE

Summary of Assessment Handbook, CG-446-3

RRC

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Flammable solid

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed.

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** 22.99
13 3 **Boiling Point at 1 atm**
1621 F = 883 C = 1156 K
13 4 **Freezing Point** 207.5 F = 97.5 C = 370 K
13 5 **Critical Temperature.**
3632 F = 2000 C = 2273 K
13 6 **Critical Pressure**
5080 psia = 34 atm = 3.4 MN/m²
13 7 **Specific Gravity:** 0.971 at 20 C (solid)
13 8 **Liquid Surface Tension:** Not pertinent.
13 9 **Liquid-Water Interfacial Tension:** Not pertinent.
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent.
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
13 12 **Latent Heat of Vaporization** Not pertinent.
13 13 **Heat of Combustion** Not pertinent.
13 14 **Heat of Decomposition** Not pertinent.
13 15 **Heat of Solution:** Not pertinent.
13 16 **Heat of Polymerization.** Not pertinent.

Continued inside back cover

NOTES

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SAB — SODIUM ALKYLBENZENESULFONATES

Common Synonyms
Sulfonated alkylbenzene sodium salt
Alkylbenzenesulfonic acid, sodium salt

Thick liquid or solid. Pale yellow. Faint detergent odor.

Mixes with water. Soap bubbles may be produced.

Fire

Not flammable.

Exposure

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant.
Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Alkylbenzenesulfonic acid, sodium salt; Sulfonated alkylbenzene, sodium salt

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_nH_{n+1}C_6H_4SO_3Na$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Powder or thick liquid

4 2 **Color:** Pale yellow

4 3 **Odor:** Faint detergent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield; rubber gloves.

5 2 **Symptoms Following Exposure:** In general, these chemicals have a moderate order of toxicity. Repeated skin contact with concentrated solutions may cause dermatitis. Ingestion may cause gastrointestinal irritation, vomiting, and diarrhea.

5 3 **Treatment for Exposure:** INGESTION: induce vomiting and call a doctor. EYES OR SKIN: flush with copious amounts of water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits.** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2. LD_{50} 0.5 to 5 g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Non volatile

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Irritating vapors may be generated

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 5.6 p.m (100% SAB)/96 hr/bluegill/TL_m/fresh water
8.2 ppm/96 hr/winter flounder/TL_m/salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 4%, 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Colgate Palmolive Co
300 Park Ave
New York, N Y 10022

2 Lever Bros Co
390 Park Ave
New York, N Y 10022

3 Witco Chemical Corp
Organic Division
1914 S Kilbourn Ave
Chicago Ill 60623

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Vary with each manufacturer and with intended use. Some is shipped as a thick, concentrated water solution; some as a solid often mixed with other solids such as sodium phosphate. Ordinary household detergents are good examples of this substance.

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** Not required

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid or solid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.0 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

SAS — SODIUM ALKYL SULFATES

Common Synonyms
Sodium hydrogen alkyl sulfate

Solid or thick liquid Pale yellow Faint detergent odor

Mixes with water. Soap bubbles may be produced

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
LIQUID OR SOLID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sodium hydrogen alkyl sulfate
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula.** $C_nH_{2n+1}OSO_3Na$
3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid or solid
4 2 **Color:** Colorless to pale yellow
4 3 **Odor:** Weak detergent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** In general these chemicals have a mild acute toxicity. Repeated skin contact with concentrated solutions may cause dermatitis. Ingestion may cause gastrointestinal irritation, vomiting and diarrhea
5 3 **Treatment for Exposure:** INGESTION: induce vomiting and follow with gastric lavage. SKIN: wash with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion.** Grade 2 LD50 0 to 5 g/kg
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics.** Non-volatile
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Expelled by salivation, and if swallowed remain may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire:** May give off irritating vapors
6 7 **Ignition Temperature** Not flammable
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
96 ppm/24 hr/goldfish/fresh water/Tap water/Experimental conditions
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Theoretical 1.5 lbs
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. E I duPont de Nemours & Co Inc
Petrochemical Division
Wilmington DE 19898
2. Matheson Gas Co
Gas Chemical Division
166 Walnut St
Kansas City MO 64116
3. Union Carbide Corp
Chemicals and Plastics Div
270 Park Ave
New York NY 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Varies with each manufacturer and with intended use. Some are shipped as a thick concentrated water solution, some as a solid mixed with basic solids such as sodium phosphate. Ordinary household detergents are good examples of this substance.
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid or solid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm.** Decomposes
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** Data not available
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Condensed from Sweet

NOTES

SAM SODIUM AMIDE

Common Synonyms
Sodamide

Solid | Colorless | Odorless

Sinks and reacts violently with water

Fire

FLAMMABLE
POISONOUS GAS IS PRODUCED IN FIRE

Exposure

SOLID
Will burn skin and eyes

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning
Restrict access
Should be removed
Dispersed flush

2. LABELS



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sodamide
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula.** $NaNH_2$
3 4 **IMCO/United Nations Numerical Designation:** 4 3 1425

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** Gray
4 3 **Odor** Like ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gas approved shield dust and vapor proof goggles and shoes
5 2 **Symptoms Following Exposure:** Ammonia gas released by reaction of solid with moisture irritates eyes and skin. Solid causes caustic burns of eyes and skin. Ingestion of small amount of material may cause death. Inhalation of gas may cause death.
5 3 **Treatment for Exposure:** INGESTION give water to drink to dilute material in stomach. Induce vomiting. Call physician immediately. DO NOT induce vomiting. Call physician. SKIN OR EYES Flood affected area with copious amounts of water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion** Data not available
5 7 **Irritant Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Only that of ammonia formed by reaction of solid with moisture in air
5 9 **Liquid or Solid Irritant Characteristics** Solid causes caustic burns similar to lye
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Flammable solid
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents** Dry sand, graphite, salt or other recommended dry powder. Do not use water
6 4 **Fire Extinguishing Agents Not to be Used** Water
6 5 **Special Hazards of Combustion Products** Toxic and irritating gases are liberated when heated
6 6 **Behavior in Fire** Data not available
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently and progressively to evolve flammable and caustic ammonia gas
7 2 **Reactivity with Common Materials.** Data not available
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Caustic solution formed by reaction with water can be diluted with water and then neutralized by acetic acid
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Fairchar Research Laboratories Inc
3702 Eastern Ave
Walloughby, Ohio
2. Pace Chemical Inc
P.O. Box 66
New Martinsville, W. Va. 26155
3. Vertom Corp
Alfa Products Division
Beverly, Mass. 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure, Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere.** Must be dry
10 4 **Venting** Sealed containers must be stored in well ventilated area

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

RK

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 39.01
13 3 **Boiling Point at 1 atm** 752 F = 400 C = 673 K
13 4 **Freezing Point:** 410 F = 210 C = 483 K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.39 at 20 C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

SDA

SODIUM ARSENATE

Common Synonyms
Sodium arsenate, dibasic
Disodium arsenate heptahydrate

Solid | White | Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause coughing, nausea, vomiting or loss of consciousness

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Disodium arsenate heptahydrate, Sodium arsenate, dibasic
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Na_2HAsO_4 \cdot 7H_2O$
3 4 **IMCO/United Nations Numerical Designation:** 6.1 1685

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Inhalation of massive doses can cause laryngitis, bronchitis. Ingestion causes constriction in throat and difficulty in swallowing, also causes burning and pain, vomiting, profuse diarrhea, dehydration, cyanosis, coma, convulsions, and death. Contact with eyes causes irritation. Contact with skin causes various skin eruptions, more often as a late manifestation or chronic poisoning
5 3 **Treatment for Exposure:** INHALATION: remove victim from exposure, support respiration. INGESTION: gastric lavage with water, followed by 1 glass of milk, consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as arsenic)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4, LD_{50} < 50 mg/kg
5 7 **Late Toxicity:** Possible carcinogenic effects on skin and lungs
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
248 ppm / minnows / lethal conc. / fresh water
32 ppm / 7 days / goldfish / IJ / fresh water
* time period not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Bioconcentrative only to fish; not likely to be a problem in spill situation

9. SELECTED MANUFACTURERS

1 J T Baker Chemical Co
Phillipsburg, N J 08865
2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514
3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh, Pa 15219

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent, Technical 95+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 312
13 3 **Boiling Point at 1 atm:** (decomposes) 356°F = 120°C = 453°K
13 4 **Freezing Point:** 135°F = 57°C = 330°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.87 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued from page 5 and 6

NOTES

SAR

SODIUM ARSENITE

Common Synonyms

Sodium meta arsenite
Sodium ortho arsenite

Solid — White to gray — Odorless

Mixes with water

Fire

Not Flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contamination
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sodium metaarsenite
Sodium orthoarsenite

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $NaAsO_2$; Na_3AsO_3

3 4 **IMCO/United Nations Numerical Designation:** Solid 6.1/2027
Aq soln 6.1/1686

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to gray

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, rubber gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Dust may irritate eyes. Ingestion or excessive inhalation of dust causes irritation of stomach and intestines with nausea, vomiting and diarrhea, bloody stools, shock, rapid pulse, coma

5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: wash with large amounts of water. INGESTION: immediately induce evacuation of intestinal tract by gastric lavage and saline cathartic; see physician immediately; consider possible development of arsenic poisoning

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as arsenic)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4; oral LD_{50} = 42 mg/kg (rat)

5 7 **Late Toxicity:** May be carcinogenic. Arsenic poisoning may develop

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic arsenic fumes may be given off in fires. Self-contained breathing apparatus should be used

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 30.5 mg/l 48-hr rainbow trout TL_m fresh water

8 2 **Waterfowl Toxicity:** 5.0 g/kg LD_{50}

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Mallinckrodt Chemical Works
Industrial Chemicals Division
Second and Mallinckrodt Streets
P O Box 5439
St Louis, Mo 63160

2 Chevron Chemical Co
940 Hensley St
Richmond, Calif 94804

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure
Technical (55 - 98%)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 1139°F = 615°C = 888 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.87 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

SAZ	# SODIUM AZIDE

Common Synonyms

Solid White Odorless

Mixes with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Containers may explode in fire

Exposure

DUST
POISONOUS IF INHALED

SOLID
POISONOUS IF SWALLOWED

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate warning to non-water contaminant
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hydrazoic acid sodium salt
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** NaN_3
3.4 **IMCO/United Nations Numerical Designation:** 0 1 1 6 8 *

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, protective clothing, goggles
5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes dizziness, weakness, blurred vision, slight cyanosis, irregular breath, and feeling of going to faint, moderate reduction of blood pressure and headward a. Contact with eyes or skin causes irritation
5.3 **Treatment for Exposure:** Give oxygen if weakness, pallor or low blood pressure is observed. INHALATION: remove victim to fresh air, give artificial respiration if necessary, call a doctor. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. INGESTION: if a large amount of water is available, vomiting at once, get medical attention
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4, Oral LD_{50} = 27 mg/kg (rat)
5.7 **Late Toxicity:** Potent mutagen of salmon sperm DNA
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** May form toxic hydrazoic acid fumes in fire
6.6 **Behavior in Fire:** Containers may explode
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves to form an alkaline solution. The reaction is not hazardous
7.2 **Reactivity with Common Materials:** Forms explosive sensitive materials with some metals such as lead, silver, mercury, and copper
7.3 **Stability During Transport:** Stable unless in contact with acids
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 3 ppm 24 hr bluegill TL$_m$ fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Fairmount Chemical Co., Inc.
117 Blanchard Street
Newark, N.J. 07105

2 Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

3 PCR, Inc.
P.O. Box 1466
Gainesville, Fla. 32602

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Pure 99+%
Practical grade
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
Molecular Weight: 65
Boiling Point at 1 atm: Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.85 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

SBS	# SODIUM BISULFITE

Common Synonyms
Sodium acid sulfite
Sodium metabisulfite

Solid powder or granules White Odorless to irritating odor

Sinks and mixes with water

Fire

Not flammable

Exposure

DUST
Harmful if inhaled

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

Dispersed with

2. LABELS

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sodium acid sulfite
Sodium metabisulfite
Sodium pyrosulfite

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $NaHSO_3$ Na_2O

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Pungent odor of burning sulfur when moist

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles, rubber gloves

5 2 **Symptoms Following Exposure:** Powder is irritating to eyes, nose and skin and can cause pain. Ingestion may cause irritation of stomach. Very large doses may cause respiratory depression and death.

5 3 **Treatment for Exposure:** INHALATION OR INGESTION get medical attention. EYES flush with plenty of water for at least 15 min. and get medical attention. SKIN wash with plenty of water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2 [illegible]

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Not available

5 9 **Liquid or Solid Irritant Characteristics:** Irritating to eyes and mucous membranes

5 10 **Odor Threshold:** Not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not applicable

6 7 **Ignition Temperature:** Not applicable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not applicable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Not reactive

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 24/ppm 24 hr. [illegible] mosquito fish
11 ppm [illegible]

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Reacts chemically with dissolved oxygen even in absence of aerobic organisms

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Virginia Chemicals Corp.
Industrial Chemicals Division
Portsmouth, Va. 23703

2. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

3. Stauffer Chemical Co.
3100 West Norfolk Rd.
Portsmouth, Va. 23703

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Various grades (97-100%)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG-446-2)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 104.07

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.48 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not applicable

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

NOTES

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SDB

SODIUM BORATE

Common Synonyms
Sodium tetraborate anhydrous
Borax anhydrous
Sodium biborate
Sodium pyroborate

Solid | White | Odorless

Sinks and mixes slowly with water

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat

SOLID
Irritating to skin and eyes
If swallowed will cause headache, dizziness, nausea or vomiting

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-1)

Disperse and flush

2. LABELS

No hazard label required by Coast Guard Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Borax anhydrous, Sodium biborate, Sodium pyroborate, Sodium tetraborate anhydrous

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $Na_2B_4O_7$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask and goggles or face shield

5.2 **Symptoms Following Exposure:** No adverse effects from inhaling borax have been reported. Ingestion may cause acute or chronic effects. Initial symptoms are nausea, vomiting and diarrhea; these may be followed by weakness, depression, headaches, skin rashes, drying skin, cracked lips and loss of hair; shock may follow ingestion of large doses and may interfere with breathing. Eye contact with powder or solution may cause irritation; no chronic effects have been documented, but continued contact should be assumed. Dermal irritation may result from contact with powder or dissolving components. The latter may cause chronic dermatitis on prolonged contact, and skin is known enough borax may be absorbed to cause boric acid poisoning (symptoms are similar to those for ingestion).

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air; call physician immediately; give mouth-to-mouth resuscitation if breathing has stopped, give oxygen if available and keep victim warm. INGESTION: get medical attention quickly; if victim is conscious, give warm salts or soapy water to induce vomiting; repeat until vomit is clear; additional water may be given to wash out stomach. EYES: get medical attention quickly; flush with copious amounts of water for at least 15 minutes. If physician is not available, another victim may be used. SKIN: flush with water; remove contaminated clothing under shower; do not use chemical neutralizer; get medical attention, gauze burn if minor.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ = 5 g/kg

(Continued on page 2)

6 FIRE HAZARDS

6 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not applicable

6.3 **Fire Extinguishing Agents:** Not applicable

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Contained material in glass, metal or plastic containers may be exposed to fire and transported without hazard elsewhere

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** None

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] ppm [illegible] after [illegible] hours. Not [illegible] ppm [illegible] hours. [illegible] Fish [illegible] Test data [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Name of Chemical
Industrial Chemicals Div.
Westvaco (New York)

2. [illegible] McGean Chemical Co.
McGean Bldg.
[illegible]

3. U.S. Borax and Chemical Corp.
[illegible] Wilshire Blvd.
Los Angeles, Calif. 90017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** In addition to anhydrous sodium borate, Na$_2$B$_4$O$_7$, both pentahydrate and decahydrate are commercially available. The decahydrate is sometimes called Borax and U.S.P. grades.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

XX

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 2)

5 HEALTH HAZARDS (Cont'd)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

SBH	# SODIUM BOROHYDRIDE

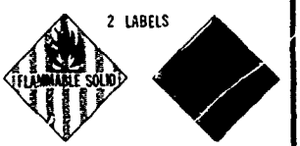
Common Synonyms Borohydride	Solid powder or pellets White Odorless Soluble and mixes with water Flammable gas is produced
Fire	Combustible Flammable, explosive gas may be produced on contact with metals, acids or when heated
Exposure	DUST Harmful if inhaled SOLID Irritating to skin and eyes Harmful if swallowed or if skin is exposed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook Cu 445 4)

Issue warning flammable
corrosive
Restrict access
Should be removed

2 LABELS



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula** $NaBH_4$
3 4 **IMCO/United Nations Numerical Designation** 4 3 1426

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or solution in caustic soda
4 2 **Color** White
4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles rubber gloves and protective clothing
5 2 **Symptoms Following Exposure** Solid irritates skin If ingested can form large volume of gas and lead to a gas embolism
5 3 **Treatment for Exposure** INGESTION do NOT induce vomiting give dilute vinegar lemon juice milk or oil call a doctor SKIN AND EYES flood with large amount of water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion** Violent reaction with acid in stomach Considered toxic because of boron content
5 7 **Late Toxicity.** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Not available
5 9 **Liquid or Solid Irritant Characteristics** Irritates skin
5 10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Flammable solid
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents** Graphite limestone soda ash sodium chloride powders
6 4 **Fire Extinguishing Agents Not to Be Used** Water carbon dioxide or halogenated extinguishing agents
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Decomposes and produces highly flammable hydrogen gas
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts to form flammable hydrogen gas
7 2 **Reactivity with Common Materials** Reacts with acids to form toxic flammable diborane gas Slowly corrodes glass
7 3 **Stability During Transport** Stable unless mixed with acids or overheated when flammable hydrogen gas is formed
7 4 **Neutralizing Agents for Acids and Caustics:** Caustic formed by reaction with water can be diluted and or neutralized with acetic acid
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Callery Chemical Co
Callery Pa 16024
2 Ventron Corp
Alfa Products Division
Beverly Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98 99 5 minimum purity dry powder pellets 12 solution in 40 aqueous sodium hydroxide
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting:** Sealed containers must be stored in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

RR C

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 37 83
13 3 **Boiling Point at 1 atm** Decomposes
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity.** 1 074 at 20°C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

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SCD	# SODIUM CACODYLATE

Common Synonyms	Solid or solution	White solid or colorless to light yellow solution	Odorless
Sodium dimethylarsenate Arrecodile Arsecodile Arsycodile Phytar	Mixes with water		

AVOID CONTACT WITH SOLID AND LIQUID

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	VAPOR OR DUST POISONOUS IF INHALED Irritating to eyes LIQUID OR SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Arrecodile Arsecodile Arsycodile, Phytar 160, Phytar 560 Sodium dimethylarsonate

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $(CH_3)_2AsOONa$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1688

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid or water solutions

4 2 **Color:** Colorless to light yellow

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield dust mask rubber gloves

5 2 **Symptoms Following Exposure:** Dust may irritate eyes Ingestion or excessive inhalation causes irritation of stomach and intestines with nausea, vomiting, diarrhea shock, rapid pulse, coma

5 3 **Treatment for Exposure:** INHALATION remove victim from exposure call physician EYES flush with water SKIN flush with water and wash well with soap and water INGESTION call physician, induce evacuation of intestinal tract by inducing vomiting giving gastric lavage and a saline cathartic Do NOT use BAL as an antidote

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 2, oral LD_{50} = 2,600 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Arsenic-containing fumes are emitted

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Corrodes common metals, but reaction is not hazardous

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** Data not available

9 SELECTED MANUFACTURERS

The Ansul Company
One Stanton Street
Marinette Wis 54143

10. SHIPPING INFORMATION

10 1 **Grades or Purity:**
22 28% sodium cacodylate
3 5% cacodylic acid, balance inert solid or water.

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 160 0

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** (est) >1 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 1 and 81

NOTES

SOC

SODIUM CHLORATE

Common Synonyms
Chlorate of soda

Solid crystals or powder Colorless to pale yellow Odorless

Sinks and mixes with water

Fire

Not flammable
CONTAINERS MAY EXPLODE IN FIRE
May cause fire on contact with combustibles

Exposure

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See E 200-series Methods Handbook CG-446-4)

Isolate water of high flammability
Should be removed
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Chlorate of soda
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** $NaClO_3$
3 4 **IMCO/United Nations Numerical Designation** 1495

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Pale yellow to white
4 3 **Odor** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Clean work clothing (must be washed well with water after each exposure) rubber gloves and shoes where dusty goggles and in approved dust respirator Do NOT use oils greases or protective creams on skin

5 2 **Symptoms Following Exposure:** Ingestion of a toxic dose (1/2 oz) tends to cause gastroenteritis pain vomiting and diarrhea Possible respiratory difficulties including failure of respiration Kidney and liver injury may also be produced Lethal oral dose for an adult is approximately 15 gm Contact with eyes causes irritation

5 3 **Treatment for Exposure** INGESTION induce vomiting and follow with gastric lavage saline cathartics fluids therapy and oxygen EYES wash thoroughly with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion** Grade 4 LD50 to 500 mg/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Not volatile

5 9 **Liquid or Solid Irritant Characteristics** Prolonged exposure to solid or dust causes irritation

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable but supports combustion

6 2 **Flammable Limits in Air.** Not pertinent

6 3 **Fire Extinguishing Agents.** Water

6 4 **Fire Extinguishing Agents Not to be Used.** Fire blankets

6 5 **Special Hazards of Combustion Products** In fire situations oxygen may be liberated and increase the intensity of the fire

6 6 **Behavior in Fire:** Melts then decomposes to give oxygen gas that increases the intensity of fire Reacts explosively either as a solid or a liquid with all organic matter and some metals

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** Chlorates are powerful oxidizing agents Can cause explosions when heated or rubbed with wood organic matter sulfur and many metals Even water solutions react in this way if stronger than 30% especially when warm

7 3 **Stability During Transport:** Starts at 572°F with evolution of oxygen gas Decomposition may be self sustaining Oxygen increases intensity of fires

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
11 000 ppm perch threshold toxicity fresh water
6 ppm sunfish threshold toxicity fresh water

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Kerr McGee Chemical Corp
Kerr McGee Bldg
Oklahoma C Okla 73102

2 Occidental Petroleum Corp
Hooker Chemical Co
Industrial Chemicals Division
Niagara Falls N Y 14302

3 Penn Olin Chemical Co
Calvert City Ky 42029

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Technical (99 5% minimum) Treated (99 0% minimum)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Oxidizing material

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	
Flammability (Red)	0	0
Reactivity (Yellow)	2	2
	OXY	OXY

*First column refers to non fire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight.** 106 45

13 3 **Boiling Point at 1 atm** Decomposes

13 4 **Freezing Point:** 478°F = 248°C = 521°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 2 49 at 15°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on page 5 and 6)

NOTES

REVISED 1978

SCH

SODIUM CHROMATE

Common Synonyms
Sodium chromate (VI)
Neutral sodium chromate
anhydrous

Solid | Yellow | Odorless

Sinks and mixes with water

[illegible]

Fire

Not flammable
Will increase the intensity of a fire
May cause fire on contact with combustibles
[illegible]

Exposure

[illegible]

DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea or loss of consciousness

[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Neutral sodium chromate anhydrous Sodium chromate (VI)

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula.** Na_2CrO_4

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Yellow

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U S Bu Mines approved respirator rubber gloves chemical safety goggles rubber apron and sleeves, face shield rubber shoes protective clothing

5 2 **Symptoms Following Exposure** Inhalation causes irritation and may ulcerate mucous membranes continued irritation of the nose may lead to perforation of the septum Ingestion causes severe circulatory collapse and toxic nephritis may be fatal Contact with eyes causes severe irritation and possible conjunctivitis Irritates skin and can cause ulcers if skin is broken prolonged contact may cause "chrome sores" (slow healing hard rimmed ulcers) which leave the area vulnerable to infection as a secondary effect

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air get medical attention INGESTION get immediate medical help if vomiting is not spontaneous give an emetic such as soapy water followed by copious water intake EYES immediately flush with plenty of water for at least 15 min , consult physician promptly SKIN immediately flush with plenty of water for at least 15 min , persistent dermatitis should be referred to physician wash contaminated skin or clothing until chromate color disappears

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0 1 mg/m³ (as chromic acid)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade V LD$_{50}$ 500 mg/kg

5 7 **Late Toxicity** Possible lung cancer

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic chromium oxide fumes may form in fire

6 6 **Behavior in Fire** May increase intensity of fire when in contact with combustible material

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials** In contact with combustible materials may cause fire

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 300 mg l 24 hr bluegill 22 m fresh water
40 60 ppm 24 hr shore crab toxic salt water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential** Bioconcentrative to 2 000 fold but not likely to be a problem in a spill situation

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Div
P O Box 1139R
Morristown N J 07960

2 PPG Industries Inc
One Gateway Center
Pittsburgh Pa 15222

3 J T Baker Chemical Co
Phillipsburg N J 08865

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent
Commercial Tetrahydrate grade

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 162

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2 723 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** −24 5 Btu lb
= −13 6 cal g = −2 5 × 10⁷ J kg

13 16 **Heat of Polymerization** Not pertinent

Continued on page Sch-6

NOTES

SCN SODIUM CYANIDE

Common Synonyms	Solid granules, flakes or lumps White Almond odor Sinks and mixes with water

Fire

Not flammable

Exposure

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning - poison
Restrict access
Evacuate area
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Hydrocyanic acid sodium salt
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula** NaCN
3 4 **IMCO United Nations Numerical Designation** 1689

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** White
4 3 **Odor:** Odorless when dry. When moist it has a slight odor of hydrocyanic acid

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Protective gloves when handling solid sodium cyanide rubber gloves when handling cyanide solutions wash hands and rubber gloves thoroughly with running water after handling cyanides) U S Bureau of Mines approved dust respirator approved chemical safety goggles

5 2 **Symptoms Following Exposure** As little as 150 milligrams is a rapidly fatal poison if ingested Non lethal doses may cause toxic symptoms Strong water solutions or the solid itself can be absorbed by the skin and cause deep ulcers which heal slowly

5 3 **Treatment for Exposure.** INGESTION Treatment immediately call a physician Carry victim to fresh air have victim lie down keep him quiet and warm until physician arrives

- If victim is conscious and breathing induce vomiting by giving emetic or warm salt water (1 tablespoon salt per cup water) repeat until vomit fluid is clear Then have victim drink one pint of 1% solution of sodium thiosulfate to be repeated in 1 hour
- If victim has stopped breathing give artificial respiration until breathing starts
- If victim is unconscious but breathing give oxygen from an inhalator

For all of the conditions above victim breathe an Amyl nitrite Break nitrite pearls in a cloth and hold lightly under victim's nose for 15 seconds repeating 3 times at about 15 second intervals If necessary repeat this procedure every 5 min with fresh pearls until 3 or 4 have been given (Pearls must not be over 2 years old Avoid breathing amyl nitrite while administering to victim)

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion** Grade 4 Below 50 mg/kg

6. FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air.** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature.** Not flammable
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** When sodium cyanide dissolves in water, a mild reaction occurs and some poisonous hydrogen cyanide gas is released This gas is not hazardous except in an enclosed space If the water is acidic however, toxic amounts of the gas will form at once.
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.13 ppm/96 hr bluegill 11 m fresh water
0.28 ppm/48 hr prawn LC50 salt water
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).**
Theoretical 7 days
8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 E I duPont de Nemours & Co Inc
Electrochemicals Dept
Wilmington DE 19898
2 Mallinckrodt Chemical Works
Industrial Chemical Division
2nd and Mallinckrodt Sts
St Louis Mo 63160

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99+%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Sealed containers must be stored in well ventilated area

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Poisonous liquid or solid Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight** 49.01
13 3 **Boiling Point at 1 atm** Very high
13 4 **Freezing Point**
1047 K = 564°C = 1043°F
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity** 1.60 at 25°C (solid)
3 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on next Card A

5 HEALTH HAZARDS (Cont'd)

5 7 **Late Toxicity** None
5 8 **Vapor (Gas) Irritant Characteristics** Non volatile but moisture in air can liberate some lethal hydrogen cyanide gas
5 9 **Liquid or Solid Irritant Characteristics.** Dust severe skin irritant may cause pain and second degree burns after a few minutes contact
5 10 **Odor Threshold** Not pertinent

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SDT	SODIUM DICHLORO-s-TRIAZINETRIONE

Common Synonyms			
Sodium dichloroisocyanurate	Solid	White	Bleach like odor
	Mixes with water		

Fire	Not flammable May cause fire on contact with combustibles POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate marine oxidizing material
water contaminant
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sodium dichloroisocyanurate

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $NaC_3N_3O_3Cl_2$

3 4 **IMCO/United Nations Numerical Designation:** 5 1 /

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** White

4 3 **Odor:** Like chlorine

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask or chlorine canister mask goggles rubber gloves and other protective clothing to prevent contact with skin

5 2 **Symptoms Following Exposure:** Dust cause sneezing and coughing, moderate irritation of the eyes and itchiness and redness of the skin Ingestion causes burns of mouth and stomach

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air EYES flush with water for 15 min , call a physician SKIN flush with water INGESTION induce vomiting call physician

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 1 670 mg kg (rat)

5 7 **Late Toxicity:** Effects unknown in experimental animals

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable but contact with ordinary combustibles may cause fire

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents.** Water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** May form toxic chlorine and other gases in fire

6 6 **Behavior in Fire:** Decomposition can be initiated with a heat source and can propagate throughout the mass with the evolution of dense fumes Containers may explode when heated

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Forms a bleach solution the reaction is not violent

7 2 **Reactivity with Common Materials:** Contact with most foreign materials organic matter or easily chlorinated or oxidized materials may result in fire Avoid contact with oil, grease sawdust floor sweepings, easily oxidized organics

7 3 **Stability During Transport:** Stable if dry

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

FMC Corporation
Industrial Chemical Division
633 Third Avenue
New York N Y 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 39 60 % available chlorine

10 2 **Storage Temperature:** Cool ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizing material

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	2
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 220 0

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 96 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Data not available

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

SCR SODIUM DICHROMATE

Common Synonyms			
Sodium bichromate	Solid crystals	Red to orange	Odorless
	Sinks and mixes with water		

Fire	Not flammable May cause fire on contact with combustibles
Exposure	DUST Irritating to eyes, nose, and throat If inhaled will cause difficult breathing SOLID Will burn skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Hazardous Materials Handbook, CG 446-4)

Issue warning - water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms

3 2 **Coast Guard Compatibility Classification**
Not applicable

3 3 **Chemical Formula.** $Na_2Cr_2O_7$

3 4 **IMCO-United Nations Numerical Designation:** 9[illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Bright orange-red

4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Approved dust mask, protective gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation of dust or mist causes respiratory irritation sometimes resembling asthma, nasal septal perforation may occur. Ingestion causes vomiting, diarrhea, and ulcers in stomach and intestines; complications. Contact with eyes or skin produces local irritation; repeated exposure causes dermatitis.

5 3 **Treatment for Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting; call a doctor. SKIN OR EYE CONTACT: treat like acid burns; flush eyes with water for at least 15 min; external lesions can be scrubbed with a 2% solution of sodium thiosulfate.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 50-500 mg/kg

5 7 **Late Toxicity:** Some suggestion of lung cancer

5 8 **Vapor (Gas) Irritant Characteristics:** Dust or mist causes severe irritation of eyes and throat and can cause ulcers and lung injury. Effects cannot be tolerated at acute concentrations.

5 9 **Liquid or Solid Irritant Characteristics.** Severe corrosive irritant. Causes second and third degree burns. Short contact and/or very injurious to the eyes.

5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents** Flood with water

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Decomposes to produce oxygen which heated May ignite other combustibles upon contact

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** In contact with finely divided combustibles such as sawdust ignition may occur

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 148 ppm 24 hr bluegill TL$_m$ fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Diamond Shamrock Corp.
Soda Products Division
Belleville Place
Kearny, N J 07032

2 Hercules Inc.
Coatings and Specialty Products Dept
910 Market St
Wilmington, Del 19899

3 PPG Industries, Inc.
Industrial Chemical Division
PPG Cleveland Center
Pittsburgh, Pa 15222

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical grades 99.8% to 99.9%; high purity grades 99.3%, 99.9%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
ORM A

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 262.01

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point.**
673°F = 357°C = 630°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.35 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 2-SCR-A

NOTES

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SFC SODIUM FERROCYANIDE

Common Synonyms	Solid Yellow Odorless Sinks and mixes with water
Fire	Not flammable
Exposure	SOLID Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Immerse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $Na_4Fe(CN)_6$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** [illegible] goggles

5 2 **Symptoms Following Exposure:** No data available

5 3 **Treatment for Exposure:** [illegible]

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade [illegible]

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not [illegible]

5 9 **Liquid or Solid Irritant Characteristics:** Not [illegible]

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Not reactive

7 2 **Reactivity with Common Materials:** Not reactive

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
540 mg/l * daphnia magna (water flea) fresh water
* Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
0 lb/lb

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 [illegible]
Industrial Chemicals & Plastics Division
Wayne, N J 07470

2 [illegible]
345 Madison Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

NS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 484.06

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.458 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4

NOTES

SDF	SODIUM FLUORIDE

Common Synonyms	Solid crystals or powder. White or tinted blue. Odorless. Sinks in water.
Fire	Not flammable
Exposure	SOLID Poisonous if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Dispersant: Water

2. LABELS

Hazard Class: Poison B
CG Label: Poison

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Not applicable
3.2 Coast Guard Compatibility Classification: Not applicable
3.3 Chemical Formula: NaF
3.4 IMCO United Nations Numerical Designation: 1690

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid crystals or powder
4.2 Color: White or tinted blue. Not Applicable for solutions
4.3 Odor: Odorless

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Gloves, Apron, Boots
5.2 Symptoms Following Exposure: Ingestion may cause nausea, vomiting, abdominal pain, diarrhea, and convulsions. Inhalation may cause irritation of the nose and throat. Skin contact may cause irritation.
5.3 Treatment for Exposure: INGESTION: Induce vomiting with salt water or syrup of ipecac. Call a physician. Do not induce vomiting if victim is unconscious. INHALATION: Remove victim to fresh air. Call a physician. SKIN CONTACT: Wash with soap and water.
5.4 Toxicity by Inhalation (Threshold Limit Value): Not applicable
5.5 Short-Term Inhalation Limits: Not applicable
5.6 Toxicity by Ingestion: Rated Toxic to Moderately Toxic
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Not applicable
5.9 Liquid or Solid Irritant Characteristics: Not applicable
5.10 Odor Threshold: Not applicable

6 FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not applicable
6.3 Fire Extinguishing Agents: Not applicable
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Not flammable
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not flammable

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: Not reactive
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: 41 mg/L 96 HR TLm/SW (estimated) 96 HR TLm/FW (estimated) 51 mg/L 96 HR TLm/SW (estimated) 95 mg/L 96 HR TLm/FW (estimated)
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades of Purity: [illegible]
10.2 Storage Temperature: Not critical
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

SS

12 HAZARD CLASSIFICATIONS

*12.1 Code of Federal Regulations: ORM-B
*12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
*12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard	[illegible]
Flammability	0
Reactivity (Stability)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 41.99
13.3 Boiling Point at 1 atm: 2977°F = 1636°C = 1909°K
*13.4 Freezing Point: 1695°F = 924°C = 1197°K
*13.5 Critical Temperature: Not applicable
*13.6 Critical Pressure: Not applicable
13.7 Specific Gravity: 2.79 at 20°C (solid)
13.8 Liquid Surface Tension: Not applicable
13.9 Liquid-Water Interfacial Tension: Not applicable
*13.10 Vapor (Gas) Specific Gravity: Not pertinent
*13.11 Ratio of Specific Heats of Vapor (Gas): Not applicable
*13.12 Latent Heat of Vaporization: Not applicable
*13.13 Heat of Combustion: Not flammable
13.14 Heat of Decomposition: Not applicable
*13.15 Heat of Solution: Not applicable
13.16 Heat of Polymerization: Not applicable

* Assigned by author

NOTES

SDH	SODIUM HYDRIDE

Common Synonyms

Powder gray to tan Gray Kerosene odor

Reacts violently with water. Flammable gas is produced.

Fire

FLAMMABLE
MAY EXPLODE ON CONTACT WITH WATER

Exposure

SOLID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning: high flammability
Restrict access
Should be removed
Chemical and physical reaction

2. LABELS





3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification: Not applicable
3.3 Chemical Formula: NaH
3.4 IMCO United Nations Numerical Designation: 4.3 / 423

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)
4.2 Color: Gray
4.3 Odor: Odorless

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INGESTION: SKIN CONTACT:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point: Not applicable
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents: Dry powder
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere: Must be dry
10.4 Venting: Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

RR

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Flammable solid
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications:

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight: Not applicable
*13.3 Boiling Point at 1 atm:
*13.4 Freezing Point:
*13.5 Critical Temperature:
13.6 Critical Pressure:
*13.7 Specific Gravity:
13.8 Liquid Surface Tension:
*13.9 Liquid-Water Interfacial Tension:
*13.10 Vapor (Gas) Specific Gravity:
*13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization
*13.13 Heat of Combustion:
*13.14 Heat of Decomposition
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

REVISED 1978

SHS	SODIUM HYDROSULFIDE SOLUTION

Common Synonyms			
Sodium bisulfide Sodium sulfhydrate Sodium monohydrogen sulfide	Liquid Mixes with water	Light yellow to red	Rotten egg odor

Fire	Not flammable
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea vomiting or loss of consciousness
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-1

Issue warning - water upstream of spill corrosive
Restrict access
Dike as needed
Dispose as directed

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Sodium bisulfide
Sodium hydrogen sulfide Sodium sulfhydrate

3.2 **Coast Guard Compatibility Classification:** To be developed

3.3 **Chemical Formula:** $NaSH \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid water solution

4.2 **Color:** Light lemon pale yellow amber to dark red

4.3 **Odor:** Rotten eggs

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber protective equipment such as apron boots splash proof goggles gloves rainwear face respirator hose mask and breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation of mist causes irritation of respiratory tract and sensitive systems producing bad rotten egg sulfide gas which breaks down nerves of smell causes headache dizziness nausea vomiting continued exposure can result in convulsions nervous respiratory failure and death
Liquid causes marked eye irritation itching soreness or swelling and inflammation causing burning of eyes are the most common effects exposure to skin may increase the potential effects Contact of liquid with skin causes irritation and sometimes tissue destruction repeated exposure may cause dermatitis Ingestion causes severe burning and corrosion of all portions of the gastrointestinal tract pain in the throat and abdomen nausea and vomiting followed by diarrhea In severe cases collapse unconsciousness and paralysis of respiration may be expected

5.3 **Treatment for Exposure:** INHALATION move victim from contaminated atmosphere at first sign of breathing has ceased start mouth to mouth resuscitation EYES immediately flush with large quantities of running water for at least 15 minutes obtain medical attention as soon as possible while awaiting instructions from physician patient may be kept in a dark room and ice compresses applied to the eyes and forehead SKIN immediately flush affected areas with water obtain medical attention if irritation persists INGESTION obtain medical attention as soon as possible if patient is conscious induce vomiting by giving large amounts of water of warm salty water (2 tablespoons of table salt to a pint of water) if this measure is unsuccessful vomiting may be induced by touching back of patient's throat with a finger Vomiting should be encouraged until the vomitus is clear

Continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials:** Corrodes most metals but reaction is not hazardous

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Treat with water

*7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 206 mg/l 96 hr TL$_m$ aquatic fish (Bluegill) fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Stauffer Chemical Company
Industrial Chemical Division
Westport, Conn. 06880

2. PPG Industries Incorporated
Industrial Chemicals Division
One Gateway Center
Pittsburgh, Pa. 15222

3. Chemical Products Corporation
King Philip Rd.
East Providence, R.I. 02914

10 SHIPPING INFORMATION

*10.1 **Grades or Purity:** 40% solution in water

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

AP

12 HAZARD CLASSIFICATIONS

12.* **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	-
Health	
Vapor Irritant	3
Liquid or Solid Irritant	
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Species Effect	
Reactivity	
Other Chemicals	1
Water	1
Self Reactivity	0

12.* **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid

*13.2 **Molecular Weight** Not pertinent

13.3 **Boiling Point at 1 atm.** Approx 215°F = 101°C = 375°K

13.4 **Freezing Point:** Approx 45°F = 7°C = 280°K

13.5 **Critical Temperature:** Not pertinent

*13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** 1.19 at 60 Degrees

13.8 **Liquid Surface Tension:** Data not available

*13.9 **Liquid-Water Interfacial Tension** Not pertinent

*13.10 **Vapor (Gas) Specific Gravity** Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

*13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 4

5 HEALTH HAZARDS (Con't)

If patient is unconscious do not give anything but ensure there is no obstruction to his breathing chin forward and false teeth removed He will be less likely to aspirate vomit if he is placed in a face down position

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0.5 to 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second degree burn after a few minutes contact

5.10 **Odor Threshold:** [illegible] ppm

SHD

SODIUM HYDROXIDE

Common Synonyms

Caustic soda
Lye

Solid flakes or pellets | White | Odorless

Sinks and mixes with water

Fire

Not flammable
May cause fire on contact with combustibles
Flammable gas may be produced on contact with metals

Exposure

DUST
Irritating to eyes, nose and throat

SOLID
will burn skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

1.1 Evacuation Distance
1.2 Protective Clothing
1.3 Respiratory Protection

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms
3.2 Coast Guard Compatibility Classification
3.3 Chemical Formula: NaOH
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)
4.2 Color: White
4.3 Odor: Odorless

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:

5.2 Symptoms Following Exposure: INHALATION

INGESTION

SKIN CONTACT

5.3 Treatment for Exposure: INHALATION

INGESTION

SKIN

EYES

5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion: (10% solution) oral rabbit LD_{50} = 500 mg/kg
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

NS

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations
Corrosive Material
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications

Category	Classification
Health Hazard	
Flammability	0
Reactivity	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 40
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

REVISED 1978

SHC

SODIUM HYPOCHLORITE

Common Synonyms
Chlorox
Liquid Bleach

Watery liquid Green to yellow Bleaching liquid odor

Sinks and mixes with water

Fire

Not flammable

Exposure

LIQUID
Irritating to skin and eyes.
Harmful if swallowed

Water Pollution

Harmful to aquatic life in very low concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, 1978, 4

Isolate spilling containers
Dilute and flush

2 LABELS

Not a Hazardous Material
49 CFR Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Chlorox
Liquid Bleach
3.2 Coast Guard Compatibility Classification: Not applicable
3.3 Chemical Formula: NaOCl + H2O
3.4 IMCO United Nations Numerical Designation: Not Listed

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Green to yellow
4.3 Odor: Bleaching odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Rubber gloves, goggles
5.2 Symptoms Following Exposure: Liquid irritates skin and eyes. Ingestion causes burning of mouth and throat, pain in the chest and abdomen, vomiting and diarrhea.
5.3 Treatment of Exposure: INGESTION: induce vomiting by giving large quantities of water. SKIN and EYES: flush with water for 15 minutes. Get medical attention.
5.4 Toxicity by Inhalation (Threshold Limit Value): Not established
5.5 Short-Term Inhalation Limits: Not established
5.6 Toxicity by Ingestion: Grade 1, oral rat LD50 = 8.91 g/kg
5.7 Late Toxicity: Not known
5.8 Vapor (Gas) Irritant Characteristics: Not applicable
5.9 Liquid or Solid Irritant Characteristics: Irritating to skin and eyes
5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: May decompose, releasing chlorine gas
6.7 Ignition Temperature: Not flammable
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not flammable

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: Not reactive
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Dilute with water and neutralize with soda ash and water then neutralize with soda ash
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Clorox
Van Waters & Rogers
Olin Mathieson Chemical Corp.
Purex Corp. Ltd.
Lake Chlor-Alkali
Lakewood Chemical Co.
Southern Chemical Co.
Solar Pure
Roccal Manufacturing Co.

10 SHIPPING INFORMATION

10.1 Grades of Purity: Several grades with concentrations reported in ordinary household bleach
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, 1978, 3

VP

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Not Listed
12.2 NAS Hazard Rating for Bulk Water Transportation: Not rated
12.3 NFPA Hazard Classifications: Not rated

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: Not applicable
13.3 Boiling Point at 1 atm: Decomposes
13.4 Freezing Point: Not pertinent
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 1.10 @ 20°C/4°C
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not applicable
13.16 Heat of Polymerization: Not pertinent

NOTES

SML	SODIUM METHYLATE

Common Synonyms Sodium methoxide	Solid	White	Odorless
	Mixes with water		

Fire	FLAMMABLE
Exposure	DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-2

Issue warning: high fire hazard
Isolate area
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

- 3.1 **Synonyms:** Sodium methoxide
- 3.2 **Coast Guard Compatibility Classification:** Not applicable
- 3.3 **Chemical Formula:** CH_3ONa
- 3.4 **IMCO/United Nations Numerical Designation:** 3.1/1431

4 OBSERVABLE CHARACTERISTICS

- 4.1 **Physical State (as shipped):** Solid
- 4.2 **Color:** White
- 4.3 **Odor:** None

5 HEALTH HAZARDS

- 5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber gloves and splash goggles or face shield
- 5.2 **Symptoms Following Exposure:** Inhalation of dust causes severe irritation and burning of nose and throat. Contact with eyes or skin causes severe irritation and burns. Ingestion causes burning of mouth and stomach
- 5.3 **Treatment for Exposure:** Get medical attention as soon as possible. Do not induce vomiting. INHALATION remove victim to fresh air. If not breathing, give artificial respiration. Keep warm and quiet. Get medical attention as soon as possible. EYES flush with plenty of water for at least 15 minutes. Get medical attention. SKIN wash with plenty of water. Then wash with dilute vinegar. INGESTION induce vomiting by administering a tablespoonful of mustard in a glass of warm water. Repeat until vomit fluid is clear. Then give milk of magnesia, beaten egg whites, or vegetable oil. Get medical attention. Keep victim warm and quiet. Do not give anything by mouth to an unconscious person. Loosen tight clothing such as collar, belt, or shoes
- 5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
- 5.5 **Short-Term Inhalation Limits:** Data not available
- 5.6 **Toxicity by Ingestion:** Data not available
- 5.7 **Late Toxicity:** Data not available
- 5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 5.9 **Liquid or Solid Irritant Characteristics:** Data not available
- 5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not pertinent (combustible solid)
- 6.2 **Flammable Limits in Air:** Not pertinent
- 6.3 **Fire Extinguishing Agents:** Dry chemical, soda ash, lime or sand. Do not use water, foam, carbon dioxide or halogenated hydrocarbons
- 6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam
- 6.5 **Special Hazards of Combustion Products:** Not pertinent
- 6.6 **Behavior in Fire:** Container may explode in fire. Sodium methoxide ignites spontaneously in contact with chlorinated hydrocarbons
- 6.7 **Ignition Temperature:** Not pertinent
- 6.8 **Electrical Hazard:** Not pertinent
- 6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Reacts violently with water and moist air to form sodium hydroxide and methanol. The reaction is exothermic
- 7.2 **Reactivity with Common Materials:** Causes corrosion of aluminum, tin and zinc. Attacks rubber and plastics
- 7.3 **Stability During Transport:** Stable
- 7.4 **Neutralizing Agents for Acids and Caustics:** Water followed by dilute acetic acid or vinegar
- 7.5 **Polymerization:** Not pertinent
- 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
- 8.2 **Waterfowl Toxicity:** Data not available
- 8.3 **Biological Oxygen Demand (BOD):** Data not available
- 8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Hay Net Chemical Company
Industrial Chemicals Department
[illegible] Factory Street
Cincinnati, Ohio 45202

Week Corporation
Drilling Products Road
Northwood, Ohio 43619

Diamond Shamrock Chemical Company
Organic Chemicals Division
P.O. Box 348
Deer Park, Texas 77536

10 SHIPPING INFORMATION

- 10.1 **Grades of Purity:** 95%
- 10.2 **Storage Temperature:** Ambient
- 10.3 **Inert Atmosphere:** Packed in nitrogen
- 10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

SS

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Flammable solid
- 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
- 12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
- 13.2 **Molecular Weight:** 54.0
- 13.3 **Boiling Point at 1 atm:** Not pertinent (sublimes)
- 13.4 **Freezing Point:** Not pertinent
- 13.5 **Critical Temperature:** Not pertinent
- 13.6 **Critical Pressure:** Not pertinent
- 13.7 **Specific Gravity:** 1.3 (Liquid)
- 13.8 **Liquid Surface Tension:** Not pertinent
- 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
- 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 13.12 **Latent Heat of Vaporization:** Not pertinent
- 13.13 **Heat of Combustion:** Data not available
- 13.14 **Heat of Decomposition:** Not pertinent
- 13.15 **Heat of Solution:** Not pertinent
- 13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

SNT	# SODIUM NITRITE

Common Synonyms	Solid	White	Odorless
Erinitrit Filmerin	Sinks and mixes with water		

[illegible]

Fire

Not flammable
Will increase the intensity of a fire
May cause fire on contact with combustibles
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

CALL PHYSICIAN AT ONCE

DUST
Irritating to eyes, nose and throat
If inhaled will cause headache, difficult breathing, or loss of consciousness
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause headache, nausea, vomiting or loss of consciousness
[illegible]

Water Pollution

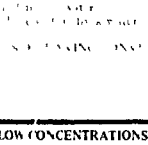
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: oxidizing material
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Erinitrit, Filmerin
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula** $NaNO_2$
3 4 **IMCO/United Nations Numerical Designation.** 5 1, 1500

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Ingestion (or inhalation of excessive amounts of dust) causes rapid drop in blood pressure, persistent and throbbing headache, vertigo, palpitations and visual disturbances, skin becomes flushed and sweaty, later cold and cyanotic, other symptoms include, nausea, vomiting, diarrhea (sometimes), fainting, methemoglobinemia. Contact with eyes causes irritation
5 3 **Treatment for Exposure:** INHALATION: move to fresh air, if exposure is severe, get medical attention. INGESTION: keep patient recumbent in a shock position and comfortable, warm, administer gastric lavage, consult a physician. EYES or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Grade 3, LD_{50} 50 - 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable, but may intensify fire
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Apply plenty of water to adjacent fires. Cool exposed containers with water
6 4 **Fire Extinguishing Agents Not to be Used**
6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires
6 6 **Behavior in Fire:** May increase intensity of fire if in contact with combustible material. May melt and flow at elevated temperatures
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
17.1 ppm, 24 hr, minnow, no effect, fresh water
7.5 ppm, 48 hr, mosquitofish, TL_m, fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown, N J 07960
2 J T Baker Chemical Co
Phillipsburg, N J 08865
3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh, Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** USP Reagent
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Solid oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 69
13 3 **Boiling Point at 1 atm** (decompose) >608°F = >320°C = >593°K
13 4 **Freezing Point:** 520°F = 271°C = 544°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 2.17 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on page 5 and 6)

NOTES

SOX	# SODIUM OXALATE

Common Synonyms			
Ethanedioic acid disodium salt	Solid	White	Odorless
	Sinks and mixes slowly with water		

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing or loss of consciousness

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. Water contaminant
Dispersed and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Ethanedioic acid disodium salt
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula.** $Na_2C_2O_4$
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color.** White
4 3 **Odor.** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure.** Inhalation or ingestion causes pain in throat, esophagus and stomach, mucous membranes turn white, other symptoms include vomiting, severe pureing, weak pulse, cardiovascular collapse, neuromuscular symptoms and kidney damage. Contact with eyes or skin causes irritation.
5 3 **Treatment for Exposure.** In prompt: INHALATION move to fresh air, if exposure to dust is severe get medical attention. INGESTION give dilute calcium lactate, lime water or milk, administer gastric lavage, consult physician, watch for edema of the glottis and delayed constriction of esophagus. EYES or SKIN flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion.** Grade 3 LD$_{50}$ 500 mg/kg
5 7 **Late Toxicity.** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air.** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire.**
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials.**
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity.** LC50 ppm/48 hr/mosquito fish, TL$_m$ fresh water
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD).** [illegible], 5 days
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 J T Baker Chemical Co
Phillipsburg, N J 08865
2 Fisher Scientific Co
711 Forbes Ave
Pittsburgh, Pa 15219
3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10. SHIPPING INFORMATION

10 1 **Grades of Purity.** Reagent
Primary standard grade
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II-SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **IMCO Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight.** 134.0
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point.** Not pertinent
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity.** 2.27 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on page 5 and A

NOTES

SPP SODIUM PHOSPHATE

Common Synonyms	Solid (powder or granules)	White	Odorless
	Sinks and mixes with water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** "Sodium phosphate" is generic term and includes the following (1) monosodium phosphate (MSP sodium phosphate monobasic) (2) disodium phosphate (DSP sodium phosphate dibasic) (3) trisodium phosphate (TSP sodium phosphate tribasic) (4) sodium acid pyrophosphate (ASPP SAPP disodium dihydrogen pyrophosphate) (5) tetrasodium pyrophosphate (TSPP)

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Granular or powdered solid some may appear glassy

4 2 **Color** White

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** U S Bu Mines toxic dust mask protective gloves chemical type goggles full cover clothing

5 2 **Symptoms Following Exposure** Inhalation of heavy dust may irritate nose and throat Ingestion may injure mouth throat and gastrointestinal tract resulting in nausea vomiting cramps and diarrhea pain and burning in mouth may occur Contact with eyes produces local irritation can lead to chronic damage Contact with skin produces local irritation repeated or prolonged contact can lead to dermatitis

5 3 **Treatment for Exposure** If the following measures do not eliminate the symptoms see a physician INHALATION give large amounts of water or warm salty water to induce vomiting repeat until vomitus is clear milk eggs or olive oil may then be given to soothe stomach EYES immediately flush with large amounts of water for at least 15 min holding eyelids apart to ensure flushing of entire surface avoid chemical neutralizers SKIN flush with water avoid chemical neutralizers

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** May melt with loss of steam

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** All dissolve readily MSP and ASPP form weakly acidic solutions TSP forms strongly caustic solution similar to soda ive TSPP forms weakly alkaline solution

7 2 **Reactivity with Common Materials** When wet mild steel or brass may be corroded by MSP ASPP and DSP The others are not considered corrosive

7 3 **Stability During Transport:** All forms of sodium phosphate are stable TSP tends to pick up moisture from air and form a hard cake

7 4 **Neutralizing Agents for Acids and Caustics:** For those sodium phosphates that form acidic or basic solutions dilution with water removes hazard

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 126 ppm 72 hr daphnia magna TLm fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Stauffer Chemical Co
Industrial Chemical Division
Westport Conn 06880

2 FMC Corporation
Inorganic Chemicals Div
633 Third Avenue
New York N Y 10017

3 Monsanto Company
800 North Lindbergh Blvd
St Louis Mo 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity** All are available in Technical Grade some in Food Grade and Reagent Grade Some are available as hydrates as well as anhydrous forms

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

3 CHEMICAL DESIGNATIONS (Cont'd.)

(6) sodium tetraphosphate (insoluble sodium metaphosphate) (7) sodium trimetaphosphate (8) sodium hexametaphosphate and (9) sodium tripolyphosphate (STPP TPP)

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula** (1) NaH_2PO_4 (2) Na_2HPO_4 (3) Na_3PO_4 (4) $Na_4P_2O_7$ (5) $Na_2P_2O_6$ (6) $(NaPO_3)_6$ (7) $(NaPO_3)_3$ (8) $(NaPO_3)_6$ NaO (9) $Na_5P_3O_{10}$

3 4 **IMCO/United Nations Numerical Designation** Not assigned

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** Values for anhydrous salts run from 120 to high polymer values

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity** 1 8 2 5 at 25°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** +8 3 to −81 Btu lb
= +46 1 to −45 cal/g
= +1 93 to −1 88 × 10 J kg

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

SSC

SODIUM SILICATE

Comm. Synonyms
Water glass
Soluble glass

Thick liquid | Colorless | Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

CAUTIONARY DATA

LIQUID
Harmful if swallowed
IF SWALLOWED [illegible] UNCONSCIOUS [illegible] water or milk
DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Water glass
Soluble glass

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula.** Na_2SiO_3 $Na_2SiO_3 \cdot H_2O$

3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** High viscosity liquid

4 2 **Color:** Colorless

4 3 **Odor.** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield

5 2 **Symptoms Following Exposure** If large doses are ingested, symptoms of mucous membrane irritation may occur similar to that caused by caustic soda solution

5 3 **Treatment for Exposure:** INGESTION (large doses) give water or milk; do NOT induce vomiting

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2 0.5 to 5 g/kg (ethanolin)

5 7 **Late Toxicity** None

5 8 **Vapor (Gas) Irritant Characteristics** Non-volatile

5 9 **Liquid or Solid Irritant Characteristics** None

5 10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature** Not flammable

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
2320 ppm 96 hr mosquito fish Hum fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Diamond Shamrock Chemical Co
[illegible] Superior Ave
Cleveland, Ohio 44114

2 E I duPont de Nemours & Co Inc
Industrial and Biochemicals Dept
Wilmington, Del 19898

3 Philadelphia Quartz Co
Public Ledger Bldg
Philadelphia, Pa 19106

10 SHIPPING INFORMATION

10 1 **Grades or Purity** A wide variety of grades which differ in concentration of sodium silicate in water, in specific gravity, and in viscosity

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** Not applicable

13 3 **Boiling Point at 1 atm** Decomposes

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity** 1.1 - 1.4 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** (est.) = 20 Btu/lb
= −10 cal/g = −0.4 × 10⁵ J/kg

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

SFR

SODIUM SILICOFLUORIDE

Common Synonyms
Sodium fluosilicate
Sodium hexafluorosilicate
Salufer

Solid | White | Odorless

Sinks in water

Fire

Not flammable

Exposure



DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
POISONOUS IF SWALLOWED
Will burn skin and eyes
If swallowed will cause nausea vomiting and loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Salufer Sodium fluosilicate, Sodium hexafluorosilicate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** Na_2SiF_6
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator goggles or face shield protective gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat Ingestion causes symptoms similar to fluoride poisoning compound is highly toxic initial symptoms include nausea cramps vomiting diarrhea and dehydration in severe cases convulsions shock and cyanosis are followed by death in 2-4 hr Contact with eyes causes irritation Contact with skin causes rash redness and burning sometimes followed by ulcer formation
5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION seek medical attention administer gastric lavage with lime water then give lime water or milk at frequent intervals EYES flush with water for at least 15 min SKIN flush with water wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 2.5 mg/m³ (as fluoride)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Grade 3 LD$_{50}$ 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire** Decomposes at red heat
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Cardinier Inc
P O Box 3269
Tampa Fla 33601
2 Fisher Scientific Co
711 Forbes Ave
Pittsburgh Pa 15219
3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 98+%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

H

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 188
13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.68 at 20°C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

SDS

SODIUM SULFIDE

Common Synonyms	Solid flakes Yellow to red Rotten eggs odor Sinks and mixes with water
Fire	Combustible POISONOUS GAS MAY BE PRODUCED IN FIRE Flammable poisonous gas is formed on contact with acids
Exposure	DUST Irritating to eyes nose and throat SOLID Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning - corrosive
Restrict access
Dispose and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** Sulfuration of sodium
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** Na2S
3 4 **IMCO United Nations Numerical Designation:** 4 2 138

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color:** Yellow or light red
4 3 **Odor** Like rotten eggs

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield
5 2 **Symptoms Following Exposure:** Caustic burns on skin and eyes. Ingestion irritates stomach and causes nausea
5 3 **Treatment for Exposure.** INGESTION give water induce vomiting call doctor SKIN OR EYE CONTACT wash with water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion** Grade 4 LD50 500 mg/kg (rat/human)
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics** Non-volatile
5 9 **Liquid or Solid Irritant Characteristics** Irritation to skin and mucous membranes
5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Moderately flammable solid
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents** Water
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products** Irritating sulfur dioxide is produced in fire
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** (Upper 48 hr bluegill sunfish TLm fresh water)
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Division
Morristown, NJ 07960
2 FMC Corp
Inorganic Chemicals Division
633 Third Ave
New York, N Y 10017
3 Mobil Oil Corp
North American Division
Paulsboro, N J 08066

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Crystals 60-62% pure water fused chips
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flamm. Safety (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 78
13 3 **Boiling Point at 1 atm** Very high
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.856 at 20° C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on page 5 and 6

NOTES

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SODIUM SULFITE

Common Synonyms	Solid Colorless Odorless Sinks and mixes slowly with water
Fire	Not flammable
Exposure	SOLIDS If swallowed may cause loss of consciousness
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4:

Dispersal

2. LABELS

Not a hazardous material as defined by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** No common synonyms

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula:** Na_2SO_3

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor.** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Dust respirator, goggles, rubber gloves

5.2 **Symptoms Following Exposure:** When heated to decomposition it emits toxic fumes of sulfur oxides. Because it rapidly decomposes in the presence of acids, it should not be used in the presence of acids. Exposure to the dust may cause irritation of the eyes, skin, and respiratory tract. Ingestion may cause gastrointestinal disturbances.

5.3 **Treatment for Exposure:** INGESTION: Induce vomiting. Get medical attention immediately. INHALATION: Remove victim to fresh air. Get medical attention immediately. EYES: Flush with water for 15 minutes. Get medical attention. SKIN: Wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** No information found.

5.5 **Short-Term Inhalation Limits.** No information found.

5.6 **Toxicity by Ingestion** GRAS 1 (Generally Recognized as Safe)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** No information found.

5.9 **Liquid or Solid Irritant Characteristics.** Mild irritant

5.10 **Odor Threshold:** No information found.

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air.** Not applicable

6.3 **Fire Extinguishing Agents** Not applicable

6.4 **Fire Extinguishing Agents Not to be Used** No information found

6.5 **Special Hazards of Combustion Products** Not applicable

6.6 **Behavior in Fire** Not applicable

6.7 **Ignition Temperature** Not applicable

6.8 **Electrical Hazard** Not applicable

6.9 **Burning Rate** Not applicable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** No information found

7.5 **Polymerization** Not applicable

7.6 **Inhibitor of Polymerization** Not applicable

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 660 ppm 24-hr TL_m (96 hr) mosquito fish
Harmful in water

8.2 **Waterfowl Toxicity:** Dangerous if ingested in large quantities

8.3 **Biological Oxygen Demand (BOD).** 0.12 lb/lb of substance

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Kappa Chemical Co.
Olin Mathieson Chemical Corp.
Pfizer Chemical Div.

Mallinckrodt Chemical Works
Merck & Co., Inc.
Philadelphia Quartz Co.
St. Louis Smelting Co.

Rockland-Atlantic Chemical Co., Inc.
Rockland
West Point, N.Y. 10996

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, 96% min.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight** 126.05

13.3 **Boiling Point at 1 atm** Decomposes

13.4 **Freezing Point** Not applicable

13.5 **Critical Temperature** Not applicable

13.6 **Critical Pressure** Not applicable

13.7 **Specific Gravity** 2.63 at 15°C/4°C

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion** Non-flammable

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 1 and 4

NOTES

SCY

SODIUM THIOCYANATE

Common Synonyms
Sodium sulfocyanate
Sodium rhodanide
Rhodanate

Solid | White | Odorless

Sinks and mixes with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Rhodanate, Sodium rhodanide, Sodium sulfocyanate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** NaSCN
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber or plastic gloves, standard goggles, rubber or plastic apron
5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion of large doses causes vomiting, extreme cerebral excitement, convulsions, and death in 10–48 hrs; short poisoning can cause flu like symptoms, skin rashes, weakness, fatigue, vertigo, nausea, vomiting, diarrhea, confusion. Contact with eyes causes irritation. Prolonged contact with skin may produce various skin eruptions, dizziness, cramps, nausea, and mild cases of disturbance of the nervous system.
5.3 **Treatment for Exposure:** INHALATION: move to fresh air; if exposure has been great, get medical attention. INGESTION: consult physician; hemodialysis is recommended as the treatment of choice. EYE OR SKIN: flush with water for 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2. LD$_{50}$: 0.5 g/kg
5.7 **Late Toxicity:** Causes birth defects in lab animal embryos
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Non-flammable
6.2 **Flammable Limits in Air:** Non-flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur and nitrogen may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1,240 ppm 24 hr fish killed fresh water
>300 ppm 48 hr green crab TL$_m$ aerated salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Argus Chemical Corp
Hallys Div
600 Terminal Ave
New Castle, Del. 19720
2. J. T. Baker Chemical Co
Phillipsburg, N. J. 08865
3. Fisher Scientific Co
711 Forbes Ave
Pittsburgh, Pa. 15219

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial 96%
Reagent 99% 50, 80% solutions in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 81.08
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 470°F = 900°C = 1173°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.1 at 20°C (solids)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 34.9 Btu/lb
= 19.4 cal/g = 0.812 × 10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5A

NOTES

SBT	SORBITOL

Common Synonyms
Sorbol
Sorbit
1,2,3,4,5,6-Hexanehexol
D-Glucitol

Liquid | Colorless | Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

LIQUID
Will burn skin and eyes

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms.

3.2 Coast Guard Compatibility Classification

3.3 Chemical Formula. $C_6H_{14}O_6$ $HOH_2C(CHOH)_4CH_2OH$

3.4 IMCO United Nations Numerical Designation.

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)

4.2 Color

4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment

5.2 Symptoms Following Exposure

5.3 Treatment for Exposure

5.4 Toxicity by Inhalation (Threshold Limit Value).

5.5 Short-Term Inhalation Limits

5.6 Toxicity by Ingestion

5.7 Late Toxicity:

5.8 Vapor (Gas) Irritant Characteristics

5.9 Liquid or Solid Irritant Characteristics

5.10 Odor Threshold

6 FIRE HAZARDS

6.1 Flash Point 542°F O.C.

6.2 Flammable Limits in Air

6.3 Fire Extinguishing Agents Water

6.4 Fire Extinguishing Agents Not to be Used.

6.5 Special Hazards of Combustion Products.

6.6 Behavior in Fire

6.7 Ignition Temperature.

6.8 Electrical Hazard.

6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water

7.2 Reactivity with Common Materials:

7.3 Stability During Transport

7.4 Neutralizing Agents for Acids and Caustics

7.5 Polymerization

7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity:

8.2 Waterfowl Toxicity:

8.3 Biological Oxygen Demand (BOD).

8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

1. ICI Americas Inc.
   Atlas Chemical Div.
   New Murphy Plant & Office
   Wilmington, Delaware
2. Merck & Co., Inc.
   Merck Chemical Div.
   Danville, Pa.
3. Pfizer Inc.
   Chemical Div.

10 SHIPPING INFORMATION

10.1 Grades or Purity: USP

10.2 Storage Temperature.

10.3 Inert Atmosphere:

10.4 Venting: Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NPQ

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations
Not Listed

12.2 NAS Hazard Rating for Bulk Water Transportation

12.3 NFPA Hazard Classification:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm.

13.2 Molecular Weight:

13.3 Boiling Point at 1 atm

13.4 Freezing Point

13.5 Critical Temperature

13.6 Critical Pressure:

13.7 Specific Gravity:

13.8 Liquid Surface Tension

13.9 Liquid-Water Interfacial Tension

13.10 Vapor (Gas) Specific Gravity

13.11 Ratio of Specific Heats of Vapor (Gas)

13.12 Latent Heat of Vaporization:

13.13 Heat of Combustion:

13.14 Heat of Decomposition.

13.15 Heat of Solution:

13.16 Heat of Polymerization

NOTES

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SRA

STEARIC ACID

Common Synonyms
Octadecanoic acid
n-Octadecylic acid
Stearophanic acid
1-Heptadecanecarboxylic acid

Solid. White Mild odor

Floats on water

Fire

Combustible

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** 1-Heptadecanecarboxylic acid; Octadecanoic acid; n-Octadecylic acid; Stearophanic acid

3.2 **Coast Guard Compatibility Classification** Not listed

3.3 **Chemical Formula:** $CH_3(CH_2)_{16}COOH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Faint

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** For prolonged exposure: respirator with dust, fume and mist cartridge; impervious gloves; safety goggles; impervious clothing

5.2 **Symptoms Following Exposure:** Compound is generally considered non-irritating to the skin. Inhalation of dust may cause irritation of the nose and throat. Dust causes mild irritation to eyes.

5.3 **Treatment for Exposure:** INGESTION: do not induce vomiting; dilute with water or milk; get medical attention. SKIN: wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 LD50 > 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 20 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** (Powdered solid) 410°-435°F (OC); 365°F (CC)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** 750°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 1.44% 5 days

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Union Camp Corp
2051 N. Lane Avenue
Jacksonville, Fla. 32205
2. Ashland Chemical Co
P.O. Box 2219
Columbus, Ohio 43216
3. Emery Industries, Inc.
4900 Este Avenue
Cincinnati, Ohio 45232

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** USP Commercial Triple pressed, Double pressed

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 284.47

13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13.4 **Freezing Point.** 69.6°C = 157.3°F = 342.8°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.941 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** -9,940 Btu/lb = -5,522 cal/g = -231.2 kcal/g-mole

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

NOTES

STY	STYRENE

Styrol
Vinylbenzene
Phenylethylene

Water: liquid Colorless to light yellow Sweet pleasant odor

Floats on water. Flammable. Irritating gas is produced.

Exposure

FLAMMABLE
CONTAINERS MAY EXPLODE IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness or loss of consciousness.

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Floating to shoreline
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
3.2 **Coast Guard Compatibility Classification:** Olefin
3.3 **Chemical Formula:**
3.4 **IMCO United Nations Numerical Designation:**

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):**
4.2 **Color:**
4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:**
5.2 **Symptoms Following Exposure:**
5.3 **Treatment for Exposure:** INHALATION
INGESTION
SKIN OR EYE CONTACT
5.4 **Toxicity by Inhalation (Threshold Limit Value):**
5.5 **Short-Term Inhalation Limits:**
5.6 **Toxicity by Ingestion:**
5.7 **Late Toxicity:**
5.8 **Vapor (Gas) Irritant Characteristics:**
5.9 **Liquid or Solid Irritant Characteristics:**
5.10 **Odor Threshold:**

6 FIRE HAZARDS

6.1 **Flash Point:**
6.2 **Flammable Limits in Air:**
6.3 **Fire Extinguishing Agents:**
6.4 **Fire Extinguishing Agents Not to be Used:**
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:**
6.8 **Electrical Hazard:**
6.9 **Burning Rate:**

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:**
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:**
7.4 **Neutralizing Agents for Acids and Caustics:**
7.5 **Polymerization:**
7.6 **Inhibitor of Polymerization:**

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
8.2 **Waterfowl Toxicity:**
8.3 **Biological Oxygen Demand (BOD):**
8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 **Grades of Purity:**
10.2 **Storage Temperature:**
10.3 **Inert Atmosphere:**
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A T E /

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	
Health	
Vapor Toxicity	
Liquid or Solid Toxicity	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Reactivity	
Other Chemicals	2
Water	0
Self Reactivity	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard	2
Flammability	3
Reactivity (Stability)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 104
13.3 **Boiling Point at 1 atm.:** 418.3 K = 293.2 K
13.4 **Freezing Point.:** 242.5 K = 242.5 K
13.5 **Critical Temperature:** 647.0 K
13.6 **Critical Pressure:** 3.85 MN/m² = 3.85 MN/m²
13.7 **Specific Gravity:**
13.8 **Liquid Surface Tension.:**
13.9 **Liquid-Water Interfacial Tension:**
13.10 **Vapor (Gas) Specific Gravity:**
13.11 **Ratio of Specific Heats of Vapor (Gas):**
13.12 **Latent Heat of Vaporization:**
13.13 **Heat of Combustion:**
13.14 **Heat of Decomposition:**
13.15 **Heat of Solution:**
13.16 **Heat of Polymerization:**

(continued on page 1 and 8)

NOTES

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SRS

SUCROSE

Common Synonyms
Beet sugar
Cane sugar
Saccharose
Saccharum
Sugar

Solid | White | Odorless

Sinks in water

Fire

Combustible

Exposure

DUST
Not harmful

SOLID
Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Beet sugar, Cane sugar, Saccharose, Saccharum, Sugar

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{12}H_{22}O_{11}$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask and goggles or face shield

5.2 **Symptoms Following Exposure:** None

5.3 **Treatment for Exposure:** EYES: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade: oral LD_{50} (30 days) = 29,700 mg/kg (rats)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating fumes may form on fires

6.6 **Behavior in Fire:** Melts and chars

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Acute effect: [illegible] mg/l 96 hr

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0.6 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Amstar Corporation
1251 Avenue of the Americas
New York, N.Y.
2. Great Western Sugar Co.
1530 16th Street
Denver, Colo.
3. Revere Sugar Refining Co.
Prudential Center
Boston, Mass.

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Food grade
Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 342.3

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** (decomposes) 320 °F = 160 °C = 433 °K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.59 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** 6,400 Btu/lb = -3,560 cal/g = -150 x 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

SFL — SULFOLANE

Common Synonyms
Tetrahydrothiophene 1 1-dioxide
Tetramethylene sulfone

Oily liquid | Colorless | Weak oily odor

Solidifies and melts and mixes with water. Freezing point is 79°F.

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

LIQUID
Not irritating to skin
Irritating to eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification
Sulfolane
3.3 Chemical Formula:
$C_4H_8O_2S$
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment.
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INGESTION: SKIN OR EYE CONTACT:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics.
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point.
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization.
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential.

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

NPQ

12 HAZARD CLASSIFICATIONS

*12.1 Code of Federal Regulations.
*12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	
Health	
Vapor Hazard	
Liquid and Solid Contact Hazard	
Water Pollution	
Reactivity	

*12.3 NFPA Hazard Classifications.

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm:
*13.2 Molecular Weight:
*13.3 Boiling Point at 1 atm.
4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
*13.7 Specific Gravity:
13.8 Liquid Surface Tension:
*13.9 Liquid-Water Interfacial Tension:
*13.10 Vapor (Gas) Specific Gravity:
*13.11 Ratio of Specific Heats of Vapor (Gas)
*13.12 Latent Heat of Vaporization.
*13.13 Heat of Combustion.
13.14 Heat of Decomposition.
*13.15 Heat of Solution:
13.16 Heat of Polymerization.

NOTES

REVISED 1978

SFD

SULFUR DIOXIDE

Common Synonyms

Liquefied compressed gas. Colorless. Sharp suffocating odor.

Liquid sinks and boils in water. Poisonous vapor is produced.

Fire

Not flammable.

Exposure

VAPOR
POISONOUS IF INHALED

LIQUID
Will cause frostbite.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms.
3.2 Coast Guard Compatibility Classification
3.3 Chemical Formula: SO_2
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits
5.6 Toxicity by Ingestion.
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics.
5.9 Liquid or Solid Irritant Characteristics
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire
6.7 Ignition Temperature
6.8 Electrical Hazard
6.9 Burning Rate

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water
7.2 Reactivity with Common Materials.
7.3 Stability During Transport.
7.4 Neutralizing Agents for Acids and Caustics.
7.5 Polymerization:
7.6 Inhibitor of Polymerization

8 WATER POLLUTION

8.1 Aquatic Toxicity
8.2 Waterfowl Toxicity
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.
12.2 KAS Hazard Rating for Bulk Water Transportation:

Category	Rating

12.3 NFPA Hazard Classifications

Category	Classification

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension.
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization.
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution.
13.16 Heat of Polymerization:

NOTES

REVISED 1978

SFA

SULFURIC ACID

Common Synonyms
Oil of vitriol
Battery acid
Fertilizer acid

Oily liquid — Colorless — Odorless

Sinks and mixes violently with water. Irritating fumes produced

Fire

Not flammable
May cause fire on contact with combustibles
Flammable gas may be produced on contact with metals
POISONOUS GAS MAY BE PRODUCED IN FIRE

Exposure

MIST
Irritating to eyes, nose and throat
If inhaled, will cause coughing, difficult breathing, or loss of consciousness

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUA LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: corrosive
Restrict access
Disperse and flush with care

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Battery acid
Chamber acid
Fertilizer acid
Oil of vitriol

3.2 **Coast Guard Compatibility Classification** Sulfuric acid

3.3 **Chemical Formula:** H_2SO_4

3.4 **IMCO/United Nations Numerical Designation** NO/1830

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless (pure) to dark brown

4.3 **Odor:** Odorless unless hot. Then choking

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Safety shower, eyewash fountain, safety goggles, face shield, approved respirator (self-contained or air-line), rubber safety shoes, rubber apron

5.2 **Symptoms Following Exposure** Inhalation of vapor from hot concentrated acid may injure lungs. Swallowing may cause severe internal burns and death. Contact with skin or eyes causes severe burns.

5.3 **Treatment for Exposure** Call a doctor. INHALATION: oxygen, set to for delayed pulmonary reaction. INGESTION: have victim drink water if possible, do NOT induce vomiting. EYES AND SKIN: wash with large amounts of water for at least 15 min., do not use oils or ointments in eyes, treat skin burns.

5.4 **Toxicity by Inhalation, (Threshold Limit Value):** 1 mg/m³

5.5 **Short-Term Inhalation Limits** 10 mg/m³ for 5 min.; 5 mg/m³ for 10 min.; 2 mg/m³ for 30 min.; 1 mg/m³ for 60 min.

5.6 **Toxicity by Ingestion** No effects except those associated with tissue damage.

5.7 **Late Toxicity** None

5.8 **Vapor (Gas) Irritant Characteristics** Vapors from hot acid (77-98%) cause moderate irritation of eyes and respiratory system. Effects temporary.

5.9 **Liquid or Solid Irritant Characteristics** 77-98% acid causes severe second and third degree burns of skin on short contact and is very injurious to the eyes.

5.10 **Odor Threshold** Greater than 1 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents.** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Water used on adjacent fires should be carefully handled

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire** Not flammable

6.7 **Ignition Temperature** Not flammable

6.8 **Electrical Hazard** None

6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Reacts violently with evolution of heat. Spattering occurs when water is added to the compound.

7.2 **Reactivity with Common Materials** Extremely hazardous in contact with many materials, particularly metals and combustibles. Dilute acid reacts with most metals releasing hydrogen which can form explosive mixtures with air in confined spaces.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Dilute with water, then neutralize with lime, limestone, or soda ash.

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 24 ppm/24 hr, bluegill, lethal, fresh water
42.5 ppm/48 hr, prawn, lethal, salt water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemical Division
P O Box 11R
Morristown, N J 07960

2 Cities Service Co Inc
North American Chemicals and Metals Group
60 Wall St
New York, N Y 10005

3 E I duPont de Nemours & Co Inc
Explosives Dept
Wilmington, Del 19898

10 SHIPPING INFORMATION

10.1 **Grades of Purity** CP, USP, Technical at 93.2 to 98% (93° Be to 66° Be)

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A P O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive Material

12.2 **USCG Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Esthetic Effect	2
Reactivity	
Other Chemicals	4
Water	3
Self-Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight** 98.08

13.3 **Boiling Point at 1 atm** (644°F) = 340°C = 613°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity*** 1.84 at 20°C (liquid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity*** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion*** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution*** −134.4 Btu/lb = −312.2 cal/g = −0.715 × 10⁶ J/kg

13.16 **Heat of Polymerization** Not pertinent

*Physical properties apply to concentrated (98%) acid unless otherwise stated. More dilute acid is more like water.

Continued on page

NOTES

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SAC SULFURIC ACID, SPENT

Common Synonyms
Dilute sulfuric acid

Oily liquid | Colorless to dark brown | Odorless

Sinks and mixes with water

Fire

Not flammable
Poisonous gas may be produced in fire
Flammable gas may be produced on contact with metals

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms
3 2 **Coast Guard Compatibility Classification** *Sulfuric acid*
3 3 **Chemical Formula.** H_2SO_4 H_2O
3 4 **IMCO/United Nations Numerical Designation:** NO 1832

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color.** Colorless to dark brown
4 3 **Odor.** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Chemical safety goggles and face shield; rubber gloves, boots, and apron
5 2 **Symptoms Following Exposure.** Contact with eyes or skin causes severe burns; blindness depending on the strength of the acid. Ingestion causes severe irritation of mouth and stomach
5 3 **Treatment for Exposure.** Call a doctor. INGESTION: do NOT induce vomiting. SKIN OR EYES: flush affected parts with large amounts of water for at least 15 min; do NOT use oils or ointments in eyes. Treat burns
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion.** No effects except those stemming from acidic damage
5 7 **Late Toxicity.** None
5 8 **Vapor (Gas) Irritant Characteristics.** Non volatile
5 9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Can cause second and third degree burns on short contact and is very injurious to the eye
5 10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air.** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** None unless strength is above 80–90% in which case heat is liberated
7 2 **Reactivity with Common Materials:** Attacks many metals releasing flammable hydrogen gas
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Limestone, lime or soda ash
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity.**
24 Sppm/24 hr bluegill lethal/fresh water
42 Sppm/48 hr prawn LC50/salt water
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Not manufactured. Dilute or spent sulfuric acid is formed as a result of various uses of the concentrated acid.

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Purity depends on the process in which the original acid is used. The strength (in water) is probably below 80% and the solution may contain a wide variety of metals and organic compounds in solution
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	0
Reactivity (Yellow)	3

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm.** 212°F = 100°C = 373°K
13 4 **Freezing Point.** Not pertinent
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.30 at 20°C (liquid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** ≤ -418 Btu/lb = ≤ -232 cal/g = ≤ -9.71 × 10⁵ J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and A

NOTES

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SXX SULFUR (LIQUID)

Common Synonyms		
Brimstone	Liquid (molten solid) Yellow, orange, tan, brown or gray Thickens and sinks in water	Faint rotten eggs odor

Fire

Combustible.
POISONOUS GAS IS PRODUCED IN FIRE.

Exposure

CAUTION: MOLTEN SULFUR
LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sulphur (liquid), Brimstone (liquid)

3 2 **Coast Guard Compatibility Classification:** Sulfur, molten

3 3 **Chemical Formula** S

3 4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Bright yellow, orange, tan, brown, gray, depending upon amount and type of hydrocarbon impurity

4 3 **Odor:** Pure sulfur is odorless, but traces of hydrocarbon impurity may impart an oily and/or rotten egg odor. Recovered sulfur usually has a strong rotten egg odor.

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety goggles with side shields, approved respirator, heat resistant gloves, rubber boots, and rubber coat. For molten sulfur, refer to hydrogen sulfide.

5 2 **Symptoms Following Exposure:** Can cause severe irritation of eyes. Irritates skin. If recovered sulfur, refer to hydrogen sulfide.*

5 3 **Treatment for Exposure.** EYES: wash excess quickly with cool water for at least 15 min. SKIN: Treat molten sulfur burns with petroleum jelly or mineral oil. If recovered sulfur, treat as for hydrogen sulfide.*

5 4 **Toxicity by Inhalation (Threshold Limit Value).** If recovered sulfur, see hydrogen sulfide.*

5 5 **Short-Term Inhalation Limits.** If recovered sulfur, see hydrogen sulfide.*

5 6 **Toxicity by Ingestion.** Grade 3 FDA Code of Safety

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** None reported

5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If soaked on clothing and allowed to remain in contact, smarting and reddening of the skin.

5 10 **Odor Threshold.** If recovered sulfur, see hydrogen sulfide.*

*Significant amounts of hydrogen sulfide, a very poisonous gas, may collect in poorly ventilated containers of liquid sulfur that has been recovered from hydrogen sulfide.

6 FIRE HAZARDS

6 1 **Flash Point.** 405°F C.C. for recovered sulfur, see hydrogen sulfide.

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Produces toxic sulfur dioxide gas.

6 6 **Behavior in Fire.** Burns with a pale blue flame that may be difficult to see in daylight.

6 7 **Ignition Temperature.** 450°F for recovered sulfur, see hydrogen sulfide.

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials:** No hazardous reactions

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** 10,000 ppm, 96 hr, mosquito fish, TL$_m$, fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Freeport Minerals Co.
   Freeport Sulphur Co. Division
   521 Grayson St.
   New Orleans, La. 70112
2. Pennzoil United, Inc.
   Duval Corp.
   19 & First City Nat'l Bank Bldg.
   Houston, Tex. 77002
3. Texas Gulf Sulfur
   200 Park Ave.
   New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Trasch liquid sulfur 98.8+%; solid sulfur is sold in many varieties and grades; these are not presently covered in this manual.

10 2 **Storage Temperature:** 270°F

10 3 **Inert Atmosphere.** Ventilated (natural)

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-X-1

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification*	
Health Hazard (Blue)	1	2
Flammability (Red)	0	0
Reactivity (Yellow)	1	1

*First column refers to non-fire situations. Ratings pertain to solid sulfur.

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 256.51

13 3 **Boiling Point at 1 atm.** 832°F = 444.6°C = 717.8°K

13 4 **Freezing Point:** 251°F = 121.7°C = 394.9°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 1.90 at 120°C (liquid)

13 8 **Liquid Surface Tension.** 60 dynes/cm = 0.060 N/m at 120°C

13 9 **Liquid-Water Interfacial Tension.** (est.) 80 dynes/cm = 0.08 N/m at 122°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent.

13 11 **Ratio of Specific Heats of Vapor (Gas).** 1.582 (est.)

13 12 **Latent Heat of Vaporization.** 150 Btu/lb = 69 cal/g = 2.9 × 10^5 J/kg

13 12 **Heat of Combustion.** −4741 Btu/lb = −2634 cal/g = −110.3 × 10^5 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5-sulf-b

NOTES

SFM

SULFUR MONOCHLORIDE

Common Synonyms

Oily liquid | Yellow to red | Irritating sharp odor

Mixes and reacts with water. Poisonous vapor is produced

Fire

Combustible

Exposure

VAPOR
Irritating to eyes.
Poisonous if inhaled

LIQUID
Will burn skin and eyes
Poisonous if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - corrosive air contaminant, water contaminant
Restrict access
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** S_2Cl_2
3 4 **IMCO United Nations Numerical Designation.** NO 1828

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color** Yellowish red
4 3 **Odor:** Suffocating pungent nauseating irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Chemical safety goggles and face shield; canister type gas mask (high concentrations) or self contained breathing apparatus (heavy concentrations); chemically resistant shoes or boots, apron, and long sleeve gloves

5 2 **Symptoms Following Exposure** Vapor irritates eyes and respiratory system; pulmonary edema may result. Liquid burns and damages eyes. Unless removed at once, it burns the skin. Ingestion causes severe irritation to mouth and stomach

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air; use artificial respiration and oxygen if required; call doctor. INGESTION: give water; do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min; obtain medical attention if any. SKIN: flush with water; remove contaminated clothing and shower

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 1 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat; in severe cases, edema and lung injury. They cannot be tolerated even at low concentrations

5 9 **Liquid or Solid Irritant Characteristics** Severe skin irritant. Causes second and third degree burns on short contact and is very irritating to the eyes

5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** 245°F C.C. = 266°F O.C.
6 2 **Flammable Limits in Air** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, water spray
6 4 **Fire Extinguishing Agents Not to be Used** Water reacts violently with compound
6 5 **Special Hazards of Combustion Products** Toxic and corrosive fumes are evolved when heated
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature.** 453°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Reacts violently with water to produce heat and hydrogen chloride fumes. The solution is strongly acid
7 2 **Reactivity with Common Materials.** The liquid dissolves rubber and plastics. After reaction with water, the strong acid formed attacks metals, generating flammable hydrogen gas
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** After reaction with water, the acid formed can be neutralized with lime or soda ash
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Hooker Chemical Corp
Industrial Chemicals Division
Niagara Falls, N.Y. 14302

2 Stauffer Chemical Co
Industrial Chemical Division
Niagara Falls, N.Y. 14302

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial material may contain 0.5% free sulfur
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

AO

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Corrosive material

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	4
Reactivity	
Other Chemicals	2
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight** 135.03
13 3 **Boiling Point at 1 atm**
280°F = 138°C = 411°K
13 4 **Freezing Point.**
-112°F = -80°C = 193°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.68 at 20°C (liquid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.129
13 12 **Latent Heat of Vaporization:**
[illegible] Btu/lb = [illegible] cal/g = 2.67×10^{4} J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** 502.2 Btu/lb = 279.0 cal/g = 11.67×10^{5} J/kg
13 16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

REVISED 1978

SCL

SULFURYL CHLORIDE

Common Synonyms

Waters liquid Colourless to pale yellow [illegible] and odor

Mixes and reacts violently with water. Poisonous gas is produced.

Fire

Not flammable.
Flammable gas may be produced on contact with metals.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause coughing, difficult breathing or loss of consciousness.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning. Isolate. Remove all contaminant.
Restrict access.
Evacuate area.
Disperse and flush with care.

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None common synonyms.
3.2 **Coast Guard Compatibility Classification:** Not applicable.
3.3 **Chemical Formula:** SO_2Cl_2
3.4 **IMCO United Nations Numerical Designation:** NA 1834

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to light yellow
4.3 **Odor:** Acrid choking.

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles and face shield. Mask with acid vapor canister, rubber gloves and boots.
5.2 **Symptoms Following Exposure:** Vapor causes severe inflammation of eyes and respiratory system. Liquid burns eyes and skin. Ingested can cause severe chemical burns and death.
5.3 **Treatment for Exposure:** Call a doctor. INHALATION: remove victim to fresh air and maintain artificial respiration if required. INGESTION: give water to drink. DO NOT induce vomiting. EYES: flush with water for at least 5 min. SKIN: wash with large amounts of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available.
5.5 **Short-Term Inhalation Limits:** Data not available.
5.6 **Toxicity by Ingestion:** Data not available.
5.7 **Late Toxicity:** None.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation to eyes and throat and can cause eye and lung injury. Low amounts tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Liquid severely irritating; may cause pain and second degree burns after a few minutes of contact.
5.10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable.
6.2 **Flammable Limits in Air:** Not flammable.
6.3 **Fire Extinguishing Agents:** Not pertinent.
6.4 **Fire Extinguishing Agents Not to be Used:** Water applied to adjacent fire should be handled carefully.
6.5 **Special Hazards of Combustion Products:** Not pertinent.
6.6 **Behavior in Fire:** Toxic and irritating gases are generated.
6.7 **Ignition Temperature:** Not flammable.
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** Not flammable.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously with water releasing hydrochloric fumes and forming sulfuric acid.
7.2 **Reactivity with Common Materials:** Acids formed by reaction with moisture attack most metals and liberate flammable hydrogen gas.
7.3 **Stability During Transport:** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Acid formed by reaction with water can be neutralized by caustic, lime, soda ash.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD):** None.
8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

1. Hooker Chemical Corp.
Industrial Chemical Division
Niagara Falls, NY 14302
2. [illegible] Corp.
Inorganic Division
270 Park Ave.
New York, NY [illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 98%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Not required.
10.4 **Venting:** Pressure vacuum.

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

VO

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material.
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 134.97
13.3 **Boiling Point at 1 atm:** 154.1°F = 69.1°C = 342.3°K
13.4 **Freezing Point:** Not pertinent.
13.5 **Critical Temperature:** Not pertinent.
13.6 **Critical Pressure:** Not pertinent.
13.7 **Specific Gravity:** 1.67 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent.
13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
13.10 **Vapor (Gas) Specific Gravity:** 4.6
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.22
13.12 **Latent Heat of Vaporization:** 59.1 Btu/lb = 33 cal/g = 2.07×10^5 J/kg
13.13 **Heat of Combustion:** Not pertinent.
13.14 **Heat of Decomposition:** Not pertinent.
13.15 **Heat of Solution:** 885.5 Btu/lb = 491.9 cal/g = 20.58×10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent.

Continued on page 5-98A

NOTES

REVISED 1978

TLO	# TALLOW

Common Synonyms
Edible tallow
Inedible tallow

Oily liquid | Dark yellow | Waxy odor

Floats on water. Freezing point is 35°F - 45°F

Fire

Combustible

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** Edible tallow
Inedible tallow
Tallow oil

3 2 **Coast Guard Compatibility Classification:** Ester

3 3 **Chemical Formula:** Not pertinent

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Dark yellow

4 3 **Odor:** Waxy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, protective clothing if exposure to hot liquid is possible

5 2 **Symptoms Following Exposure** Hot liquid can burn eyes and skin

5 3 **Treatment for Exposure:** Treat burns caused by hot liquid

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 0 [Deadline] g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Non-volatile

5 9 **Liquid or Solid Irritant Characteristics:** None

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 509°F C.C.

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents** Foam, water, carbon dioxide, or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)** 192 v. 5 days

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Atlas Refinery Inc
142 Hackensack St
Newark, N.J. 07105

2 Reilly Whiteman Inc
Conshohocken, Pa. 19428

3 Swift and Co
115 W. Jackson Blvd
Chicago, Ill. 60604

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Acidless, bulking, industrial fancy, edible, inedible

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NFI

12 HAZARD CLASSIFICATIONS

*2 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
*Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:** 35° - 45° F
= 2 °C = 278 - 280°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (est.) 0.87 at 80°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** (est.) = 15,000 Btu/lb
= -10,000 cal/g = -420 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

TFA — TALLOW FATTY ALCOHOL

Common Synonyms			
Higher fatty alcohol Stearyl alcohol crude	Waxy solid	White	Mild soapy odor
	Floats on water		

Fire	Combustible
Exposure	SOLID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Higher fatty alcohol; Stearyl alcohol crude
3 2 **Coast Guard Compatibility Classification:** Alcohol
3 3 **Chemical Formula** $C_{16}H_{33}OH$ (approx.)
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Waxy white
4 3 **Odor:** Mild soapy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves
5 2 **Symptoms Following Exposure:** Material is practically non-toxic. Contact with eyes or prolonged contact with skin can cause mild irritation
5 3 **Treatment for Exposure:** EYES: flush with water; if irritation persists, see a doctor. SKIN: wipe off; wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1,900 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** >270°F C.C.
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Procter & Gamble Distributing Co.
Industrial Chemicals Division
P. O. Box 599
Cincinnati, Ohio 45201

2 Ashland Chemical Co.
Industrial Chemicals and Solvents Div.
P. O. Box 2219
Columbus, Ohio 43216

3 M. Michel and Co., Inc.
90 Broad Street
New York, N. Y. 10004

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 242 (avg.)
13 3 **Boiling Point at 1 atm:** >480°F = >249°C = >522°K
13 4 **Freezing Point:** 127°F = 53°C = 326°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.810 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** (est.) −18,500 Btu/lb = −10,200 cal/g = −430 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

TNA — TANNIC ACID

Common Synonyms
Tannin
Chinese tannin
Gallotannic acid
Gallotannin
Glycerite

Solid — Light yellow to tan — Faint odor

Sinks and mixes with water

Fire

Combustible

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Chinese tannin
Gallotannic acid, Gr Botannin
Glycerite Tannin

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{76}H_{52}O_{46}$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Light tan to yellow

4 3 **Odor** Faint characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, coughing and sneezing. Ingestion may cause gastric disturbance. Contact with eyes causes irritation.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES or SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 2 300 mg/kg (rats)

5 7 **Late Toxicity:** Causes cancer of liver in rats

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Decomposes at 210° to carbon dioxide and pyrogallol, which can form irritating vapors

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 980 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
97 ppm 96 hr mosquitofish TL_m fresh water
<1.7 mg/l 2 hr young chinook salmon critical level salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** 86% 5 days

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. The Harshaw Chemical Co
1945 East 97 Street
Cleveland, Ohio 44106
2. J T Baker Chemical Co
Phillipsburg, N J 08865
3. Fisher Scientific Co
711 Forbes Ave
Pittsburgh, Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial 84% Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 1 701

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** >1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) = 9 510 Btu/lb = −5,450 cal/g = −228 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

TES

2,4,5-T (ESTERS)

Common Synonyms

Butyl 2,4,5-trichlorophenoxyacetate
Butoxypropyl 2,4,5-trichlorophenoxyacetate
Isooctyl 2,4,5-trichlorophenoxyacetate
2-Ethylhexyl 2,4,5-trichlorophenoxyacetate

Liquid | Yellowish brown | Mild odor

Sinks in water

Fire

Combustible
Irritating gases may be produced when heated

Exposure

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Butyl 2,4,5-trichlorophenoxyacetate; Butoxypropyl trichlorophenoxyacetate; Isooctyl trichlorophenoxy acetate; 2-Ethylhexyl trichlorophenoxy acetate

3 2 **Coast Guard Compatibility Classification:** Not listed

(continued on page 4)

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Amber dark amber

4 3 **Odor:** Very weak mixtures with kerosene or diesel oil have odor of the solvent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield and rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes intestinal disturbances. Contact with eyes or skin causes mild irritation; transient corneal injury may occur

5 3 **Treatment for Exposure:** INGESTION: promptly induce vomiting and get medical attention. EYES: flush with flowing water and get medical attention. SKIN: wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3; LD50 - 500 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 200 - 420°F CC

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Water; foam; dry chemical; carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products.** Hydrogen chloride gas and other irritating fumes may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Isooctyl ester 26 ppm/96 hr/bluegill/Flow/fresh water
Butoxypropyl ester 17 ppm/48 hr/bluegill/Flow/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640

2 Transvaal Inc
P O Box 69
Jacksonville, Ark 72076

3 Rhodia Inc
Chipman Division
259 Belmont Drive
Somerset, N J 08873

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical 96 - 99% with 1-4% solvents (kerosene or diesel oil) which are combustible

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirements

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Mixtures all greater than 300

13 3 **Boiling Point at 1 atm:**

Butyl	Butoxypropyl	Isooctyl	2-Ethylhexyl
549	651	>500	>570°F
557	344	410	>410°C
610	617	683	>683°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.2 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(continued on pages 5 and 6)

3 CHEMICAL DESIGNATIONS (Cont'd)

3 3 **Chemical Formula** 2,4,5-Cl3C6H2OCH2COOR
where R=C4H9, C8H17, etc

3 4 **IMCO/United Nations Numerical Designation:** Not listed

TBT — TETRABUTYL TITANATE

Common Synonyms

Titanium butoxide
Butyl titanate
Titanium tetrabutoxide
Butyl titanate monomer

Liquid | Colorless to light yellow | Weak alcohol-like odor

May float or sink in water. Reacts with water.

Fire

Combustible
Containers may explode in fire

Exposure

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fowling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Restrict access
Mechanical containment
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Butyl titanate, Butyl titanate monomer, Orthotitanic acid tetrabutyl ester, Titanium butoxide, Titanium tetrabutoxide

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $Ti(OC_4H_9)_4$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to pale yellow

4 3 **Odor:** Weak alcoholic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus or organic canister mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes nonspecific irritation of the upper respiratory tract. Contact with liquid may cause corneal damage in eyes and local irritation of skin. Ingestion causes nonspecific irritation of gastrointestinal tract, nausea, vomiting, cramps and diarrhea. In severe cases, central nervous system depression may result.

5 3 **Treatment for Exposure:** INHALATION: move from contaminated atmosphere. If symptoms of respiratory discomfort persist, see a physician. EYES: immediately flush with large amounts of running water for a minimum of 15 min., obtain medical attention if irritation persists. SKIN: immediately flush affected areas with water, obtain medical attention if irritation persists. INGESTION: give large amounts of water or warm salts water to induce vomiting; if this measure is unsuccessful, vomiting may be induced by tickling the back of the patient's throat with a finger, vomiting should be encouraged until vomitus is clear, obtain medical attention if abdominal discomfort persists.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 430°F C.C.

6 2 **Flammable Limits in Air:** 2 - 12

6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** water

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** May give off dense white smoke. Containers may explode.

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts to form butanol and titanium dioxide; the reaction is not hazardous.

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1. Stauffer Chemical Company
Specialty Chemical Division
Westport, Connecticut 06880

2. Ventron Corporation
Chemicals Division
8 Congress Street
Beverly, Mass. 01915

3. Dynamit Nobel of America, Inc.
105 Stonehurst Court
Northvale, N.J. 07647

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A O F U A-V

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 340

13 3 **Boiling Point at 1 atm:** 569°F = 298°C = 571°K

13 4 **Freezing Point:** -67°F = -55°C = 218°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.995 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 142 Btu/lb = 79 cal/g = 3.3 × 10⁵ J/kg

13 13 **Heat of Combustion:** (est.) -14,600 Btu/lb = -8,100 cal/g = -340 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on next page)

NOTES

TEC — TETRACHLOROETHANE

Common Synonyms 1,1,2,2-Tetrachloroethane Acetylene tetrachloride	Liquid	Colorless to pale yellow	Sweet odor
	Sinks in water		

Fire

Not flammable
Poisonous gases may be produced when heated

Exposure

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison at contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetylene tetrachloride; 1,1,2,2-Tetrachloroethane

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:** $CHCl_2CHCl_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless; slightly yellow; light yellowish green

4.3 **Odor:** Chloroform-like, pleasant like carbon tetrachloride; mild sweetish; similar to several other chlorinated hydrocarbons

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles; plastic face shield; air or oxygen supplied mask; safety hat with brim; solvent proof apron; synthetic rubber gloves

5.2 **Symptoms Following Exposure:** Compound is a powerful narcotic and liver poison; may also cause changes in blood composition and neurological disturbances. Repeated exposure by inhalation can be fatal. Ingestion causes vomiting, diarrhea, severe mucosal injury, liver necrosis, cyanosis, unconsciousness, loss of reflexes, and death. Contact with eyes causes irritation and lachrymation. Can be absorbed through the skin and may produce severe skin lesions.

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, begin artificial respiration if breathing has ceased. INGESTION: induce vomiting, call a physician. EYES: irrigate with water for 15 min. SKIN: remove clothing, wash skin thoroughly with warm water and soap.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits:** 10 ppm/30 min

5.6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} = 200 mg/kg (rat)

5.7 **Late Toxicity:** Liver poisoning; nervous disorders

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** 0.5 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Irritating hydrogen chloride vapor may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1. Hooker Chemical Corp
   Industrial Chemicals Div
   Niagara Falls, N.Y. 14302
2. Aldrich Chemical Co
   940 W. Saint Paul Ave
   Milwaukee, Wis. 53233
3. Eastman Organic Chemicals
   Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 98%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A.V.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 167.85

13.3 **Boiling Point at 1 atm:** 296.3°F = 146.3°C = 419.5°K

13.4 **Freezing Point:** −46.8°F = −43.8°C = 229.4°K

13.5 **Critical Temperature:** Data not available

13.6 **Critical Pressure:** Data not available

13.7 **Specific Gravity:** 1.595 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 37.85 dynes/cm = 0.03785 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** 5.70

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.090 at 25°C

13.12 **Latent Heat of Vaporization:** 99.2 Btu/lb = 55.1 cal/g = 2.30 × 10⁵ J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

TTE

TETRACHLOROETHYLENE

Common Synonyms
Tetrasap
Perclene
Perchlorethylene

Water: liquid Color: clear Sweet odor

Stress in water: Irritating vapor is produced

Fire

Not flammable
Poisonous gases are produced when heated

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing or loss of consciousness

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
Perc
Perk

3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon

3.3 Chemical Formula:

3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):

4.2 Color:

4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:

5.2 Symptoms Following Exposure:

5.3 Treatment for Exposure: INHALATION: INGESTION: EYES AND SKIN:

5.4 Toxicity by Inhalation (Threshold Limit Value):

5.5 Short-Term Inhalation Limits: 100 ppm for 60 min

5.6 Toxicity by Ingestion:

5.7 Late Toxicity:

5.8 Vapor (Gas) Irritant Characteristics:

5.9 Liquid or Solid Irritant Characteristics:

5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:

6.2 Flammable Limits in Air:

6.3 Fire Extinguishing Agents:

6.4 Fire Extinguishing Agents Not to be Used:

6.5 Special Hazards of Combustion Products:

6.6 Behavior in Fire:

6.7 Ignition Temperature:

6.8 Electrical Hazard:

6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:

7.2 Reactivity with Common Materials:

7.3 Stability During Transport:

7.4 Neutralizing Agents for Acids and Caustics:

7.5 Polymerization:

7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:

8.2 Waterfowl Toxicity:

8.3 Biological Oxygen Demand (BOD):

8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:

10.2 Storage Temperature:

10.3 Inert Atmosphere: No requirement

10.4 Venting: Pressure-vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
ORM-A

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fl	
Wat. Pois.	
Poison	

12.3 NFPA Hazard Classifications:

12 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:

13.2 Molecular Weight:

13.3 Boiling Point at 1 atm:

13.4 Freezing Point:

13.5 Critical Temperature:

13.6 Critical Pressure:

13.7 Specific Gravity:

13.8 Liquid Surface Tension:

13.9 Liquid-Water Interfacial Tension:
44.4 dynes/cm = 0.0444 N/m at 25°C

13.10 Vapor (Gas) Specific Gravity:

13.11 Ratio of Specific Heats of Vapor (Gas)

13.12 Latent Heat of Vaporization:

13.13 Heat of Combustion:

13.14 Heat of Decomposition:

13.15 Heat of Solution:

13.16 Heat of Polymerization:

NOTES

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ITN	TETRADECANOL

Common Synonyms
1-Tetradecanol
Myristic alcohol
n-Tetradecyl alcohol

Thick liquid (heated) Colorless Faint alcohol odor

Solidifies and floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Ecology is uncertain
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation: None

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension: 27.1 dynes/cm = 0.027 N/m at 20°C
13.9 Liquid-Water Interfacial Tension: Data not available
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion: Data not available
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

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TTD	1-TETRADECENE

Common Synonyms	Waxes liquid Colorless Mild pleasant odor Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Evolving to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO/United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications:

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

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TDB TETRADECYLBENZENE

Common Synonyms
1 Phenyltetradecane

Liquid | Colorless | Mild odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 1 Phenyltetradecane
3 2 **Coast Guard Compatibility Classification.** Aromatic Hydrocarbon
3 3 **Chemical Formula** $C_6H_5C_{14}H_{29}$ or $C_{20}H_{34}$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color** Colorless
4 3 **Odor:** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure** Ingestion may cause intestinal disturbances Contact with eyes causes irritation
5 3 **Treatment for Exposure** INGESTION induce vomiting if large amount has been swallowed EYES flush with water SKIN wipe off wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Foam dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products**
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate** 4 42 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Conoco Chemicals
Park Lights Plaza West One
Saddle Brook N J 07662

2 The Humphrey Chemical Co
Devine Street
North Haven, Conn 06473

3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X 1-1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid or liquid
13 2 **Molecular Weight:** 274 47
13 3 **Boiling Point at 1 atm:** 678°F = 359°C = 632°K
13 4 **Freezing Point:** 61°F = 16°C = 289°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 0 855 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 30 27 dynes/cm = 0 03027 N/m at 20°C
13 9 **Liquid Water Interfacial Tension.** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** 95 18 Btu/lb = 52 88 cal/g = 2 2 2 × 10⁵ J/kg
13 13 **Heat of Combustion:** −18 430 Btu/lb = −10 240 cal/g = −428 4 × 10⁵ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on page 5 and A

NOTES

TED — TETRAETHYL DITHIOPYROPHOSPHATE

Common Synonyms		
Tetraethyl dithionopyrophosphate	Liquid Sinks in water	Colorless

Fire

Fire data not available

Exposure

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning
poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment
Dispersal and flush (small discharges)

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonym:** Dithiopyrophosphoric acid OOOO tetraethylester Tetraethyl dithionopyrophosphate OOOO Tetraethyl pyrophosphorodithionate

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula** $(C_2H_5O)_2P(OPS)(OC_2H_5)$

3.4 **IMCO/United Nations Numerical Designation** 6.1 1704

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Mask with canister approved for organic phosphate pesticides goggles or face shield rubber gloves and other protective clothing to prevent contact with skin

5.2 **Symptoms Following Exposure:** Contact with liquid causes irritation of eyes and skin Compound can be absorbed through skin Ingestion of liquid or inhalation of mist causes nausea vomiting mental confusion abdominal pain sweating giddiness apprehension and restlessness Later muscular twitching of the eyelids and tongue begin then other muscles of face and neck become involved generalized twitching and muscle weakness may occur pulmonary edema cyanosis tremor and convulsions may advance to coma

5.3 **Treatment for Exposure** *Call physician; all exposures to this compound* INHALATION support respiration keep airways clear use artificial respiration if breathing is difficult or has stopped EYES flush with water immediately after contact for at least 15 min SKIN remove victim's clothing and shoes immediately using rubber gloves quickly wipe off affected area with clean cloths immediately follow with a shower using plenty of soap if complete shower is impossible wash affected skin hair and fingernails repeatedly with soap and water using clean cloths each time to prevent spreading the contamination INGESTION induce vomiting repeatedly until vomit fluid is clear (save fluid for physician's examination) if vomiting cannot be induced within 5 min have victim drink plenty of milk or water have him lie down and keep him warm if increased secretions make breathing difficult prop patient up if he stops breathing apply artificial or mouth to mouth respiration preferably through an airway wash victim's mouth of contamination mechanical resuscitator should be used if available oxygen may be necessary keep patient under observation for 24 hrs

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

Continued on page 4

6. FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents** Water dry chemical foam carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products** Toxic phosphorus and sulfur oxides are produced

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to form non hazardous products

7.2 **Reactivity with Common Materials** Corrosive to most metals in the presence of moisture

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Plan. Products Corp
Kennedy Avenue
Blue Point N Y 11715

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical, Emulsifiable concentrate Dry mixtures with inert solid > 2

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V-V-1

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Poisonous Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight.** 322.3

13.3 **Boiling Point at 1 atm.** Not pertinent (very high)

13.4 **Freezing Point.** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.19 at 25°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity.** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

5 HEALTH HAZARDS (Cont'd)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grp. Max LD_{50} < 5 mg/kg (rat)

5.7 **Late Toxicity:** Causes chromosomial damage in mice

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold** Data not available

TTG — TETRAETHYLENE GLYCOL

Common Synonyms
Hi Dry
Bis-[2-(2 hydroxyethoxy) ethyl ether
3 6 9 Trioxaundecan 1,11-diol

Liquid | Colorless to straw color | Mild odor

Sinks and mixes with water

Fire	Combustible
Exposure	LIQUID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Bis-[2-(2-hydroxyethoxy)ethyl]-ether Hi Dry
3 6 9 Trioxaundecan 1,11-diol

3 2 **Coast Guard Compatibility Classification:** Group Two

3 3 **Chemical Formula:** HOC$_4$H$_8$OC$_4$H$_8$OC$_4$H$_8$OH

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Light straw colorless

4 3 **Odor:** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield and rubber gloves

5 2 **Symptoms Following Exposure:** Compound is not irritating. No symptoms observed by any exposure route

5 3 **Treatment for Exposure:** INGESTION if large amounts are swallowed induce vomiting treat symptomatically. EYES flush with water get medical attention if ill effects develop SKIN wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 0 oral rat LD$_{50}$ 8.25 ml/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics** No appreciable hazard Practically harmless to the skin

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 360°F (O C

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents** Alcohol foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used**
Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products**

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials.**
May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
30% 5 days

8 4 **Food Chain Concentration Potential.**
None

9 SELECTED MANUFACTURERS

1 Olin Corp
120 Long Ridge Rd
Stamford Conn 06904

2 Union Carbide Corp
Chemicals & Plastics Div
270 Park Avenue
New York N Y 10017

3 The Dow Chemical Co
2030 Dow Center
Midland Mich 48640

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Liquid

13 2 **Molecular Weight:** 194.23

13 3 **Boiling Point at 1 atm:**
621°F = 327°C = 600°K

13 4 **Freezing Point**
25°F = -4.0°C = 269.0°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.12 at 20°C (liquid)

13 8 **Liquid Surface Tension**
[illegible] dynes/cm = 0.0484 N/m at 32°C

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization.**
Data not available

13 13 **Heat of Combustion:** -10 530 Btu/lb
= -5 850 cal/g = -245 × 10^3 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

TTP	# TETRAETHYLENEPENTAMINE

Common Synonyms 1,11-Diamino-3,6,9-triazaundecane	Liquid Yellow Ammonia odor May float or sink in water
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	LIQUID Will burn skin and eyes If swallowed will cause nausea
Water Pollution	Effect of low concentrations on aquatic life is unknown May be fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Restrict access
Disperse and flash

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1,11 Diamino-3,6,9 triazaundecane

3 2 **Coast Guard Compatibility Classification:** Amphatic amine

3 3 **Chemical Formula:** $H_2NCH_2CH_2NHCH_2CH_2NHCH_2CH_2NH_2$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Yellow

4 3 **Odor:** Ammoniacal disagreeable penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air supplied respirator rubber gloves complete eye protection impervious apron

5 2 **Symptoms Following Exposure:** Inhalation may cause nausea and slight irritation, compound is a sensitizer and prolonged contact may cause asthma Ingestion can cause burns of mouth esophagus and possibly stomach Contact with eyes or skin may cause burns Repeated skin contact may cause dermatitis

5 3 **Treatment for Exposure.** INHALATION remove victim to fresh air give oxygen if breathing is difficult treat allergic manifestations by usual methods INGESTION do NOT induce vomiting give large quantities of water give at least one ounce of vinegar in an equal amount of water get medical attention EYES immediately flush with plenty of water get medical care SKIN flush with plenty of water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Grade 2 oral LD_{50} = 3,990 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure may cause second degree burns on long exposure

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 340°F O C

6 2 **Flammable Limits in Air:** (est) 0 8% 4 6%

6 3 **Fire Extinguishing Agents.** Alcohol foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Ammonia and toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature:** 572°F

6 8 **Electrical Hazard.** Data not available

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corp
Chemicals & Plastics Div
270 Park Avenue
New York N Y 1001

2 Jefferson Chemical Co Inc
3336 Richmond Avenue
P O Box 5300
Houston Texas 77052

3 Dow Chemical Co
Midland Mich 48640

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 189

13 3 **Boiling Point at 1 atm:** 644°F = 340°C = 613°K

13 4 **Freezing Point** −22°F = −30°C = 243°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 0 998 at 20°C (liquid)

13 8 **Liquid Surface Tension.** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 2 of 5

NOTES

TEL	# TETRAETHYL LEAD

Common Synonyms
TEL
Lead tetraethyl

Oily liquid Colorless but generally dyed red Fruity odor

Sinks in water Poisonous flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
May burn eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Lead tetraethyl
3 2 **Coast Guard Compatibility Classification** Special class
3 3 **Chemical Formula.** $Pb(C_2H_5)_4$
3 4 **IMCO United Nations Numerical Designation** 1649

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Dyed red or other distinctive color
4 3 **Odor** Sweet

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Organic vapor type canister face mask for short periods of time; type for longer periods; neoprene coated liquid proof gloves; protective clothing; face shield; white or light colored clothing; rubber shoes or boots

5 2 **Symptoms Following Exposure** Increased urinary output of lead. If large degree of absorption by inhalation, vapors initially may cause insomnia, excitability, delirium, coma and death. Direct contact with eyes, Lead

5 3 **Treatment for Exposure** Remove victim from contaminated area and consult physician immediately. INGESTION induce vomiting. SKIN wash immediately with kerosene or similar type petroleum distillate followed by soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.1 mg/m³

5 5 **Short-Term Inhalation Limit:** 0.15 mg Pb/m³ for 30 min

5 6 **Toxicity by Ingestion** Oral rat LD_{50} = 17 mg/kg

5 7 **Late Toxicity:** Lead poisoning

5 8 **Vapor (Gas) Irritant Characteristics** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 200°F C.C. [93.3°C O.C.]
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Toxic gases are generated in fires
6 6 **Behavior in Fire** May explode in fires
6 7 **Ignition Temperature** Decomposes above 230°F
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials:** Rust and some metals cause decomposition
7 3 **Stability During Transport** Stable below 230°F. At higher temperatures may detonate or explode when confined
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 0.20 mg/l 96-hr bluegill TL_m fresh water
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 E I duPont de Nemours & Co Inc
Petroleum Chemicals Division
Antioch Calif 94509

2 Ethyl Corp
Industrial Chemicals Division
451 Florida St
Baton Rouge La 70801

3 PPG Industries Inc
Houston Chemical Co Division
Beaumont Tex 77704

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Technical
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XXX

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous liquid or solid Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	3

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight** 323.44
13 3 **Boiling Point at 1 atm** Decomposes
13 4 **Freezing Point.** −21°F = −13°C = 136°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.633 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 28.5 dynes/cm = 0.0285 N/m at (est.) 25°C
13 9 **Liquid-Water Interfacial Tension** (est.) 40 dynes/cm = 0.04 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** (est.) −7,570 Btu/lb = −4,380 kcal/g = −18.3 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on page 5)

NOTES

REVISED 1978

TEP — TETRAETHYL PYROPHOSPHATE

Common Synonyms
Ethylpyrophosphate
Nitos
TEP
TEPP

Liquid | Colorless to yellow | Faint fruity odor

Mixes with water

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant
Restrict access
Shoals: be removed
Chemical and physical treatment
Disperse and flush small discharges

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Bladan, Ethyl pyrophosphate, Killax, Mortopal, Nitos, TEP, TEPP, Tetron, Vapotone

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula** $(C_2H_5O)_4P_2O_5$ or $C_8H_{20}O_7P_2$

3 4 **IMCO/United Nations Numerical Designation.** 6 1 1705

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Water white to amber

4 3 **Odor** Aromatic, faint fruity

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Mask with canister approved for organic phosphate pesticides, goggles or face shield, rubber gloves and other protective clothing to prevent contact with skin

5 2 **Symptoms Following Exposure** Contact with liquid causes irritation of eyes and skin. Compound can be absorbed through skin. Ingestion of liquid or inhalation of mist causes nausea, vomiting, mental confusion, abdominal pain, sweating, giddiness, apprehension, and restlessness; later, muscular twitching of eyelids and tongue, begin; then other muscles of face and neck become involved, pulmonary edema, atonia, tremor, and convulsions may advance to coma

5 3 **Treatment for Exposure** *Call physician for all exposures to this compound.* INHALATION: support respiration, keep airway clear, use artificial respiration if breathing is difficult or has stopped. EYES: flush with water immediately after contact for at least 15 min. SKIN: remove victim's clothing and shoes immediately, using rubber gloves; quickly wipe off affected area with cotton cloths, immediately follow with a shower using plenty of soap; if complete shower is impossible, wash affected skin, hair, and fingernails repeatedly with soap and water using clean cloths each time to prevent spreading the contamination. INGESTION: induce vomiting by putting a finger down the throat or by giving warm salt water (one tablespoon salt per glass). Repeat until vomit fluid is clear (save fluid for physician's examination); if vomiting cannot be induced within five minutes, have victim drink plenty of milk or water, have him lie down and keep him warm; if there is difficulty in breathing due to increased secretions, chest may be cleared by propping patient up; if he stops breathing, use artificial or mouth-to-mouth respiration preferably through an airway, wash victim's mouth of contamination; mechanical resuscitator should be used if available; oxygen may be necessary; keep patient under observation for 24 hrs.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0.05 mg/m³

(continued)

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Highly toxic gases and vapors of unburned material and phosphoric acid are formed in fires

6 6 **Behavior in Fire** Water streams applied to adjacent fires will spread contamination of pesticide over wide area

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Reacts slowly to form phosphoric acid

7 2 **Reactivity with Common Materials** Corrosive to aluminum; slowly corrosive to copper, brass, zinc, and tin

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
1.0 ppm 96-hr fathead LL in fresh water
500 ppm * marine plankton, no growth of lethal salt water
*Time period not specified

8 2 **Waterfowl Toxicity** LD_{50} = 4.5 mg/kg

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Miller Chemical & Fertilizer Corp
P O Box 333
Hanover, Pa 17331

2 Chevron Chemical Co
Ortho Division
200 Bush Street
San Francisco, Calif 94120

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 40% plus (40% related ethyl phosphates, Aerosols (5–10%) (Class A poisons), Dusts (0.66–1.2%), Sprays (0.4–40%)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 290.2

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 1.18 at 25°C (liquid)

13 8 **Liquid Surface Tension** Data not available

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(continued on page 2)

5 HEALTH HAZARDS (Cont'd)

5 5 **Short-Term Inhalation Limits:** 0.25 mg/m³ for 30 min

5 6 **Toxicity by Ingestion:** Grade 4, LD_{50} < 50 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

TFE — TETRAFLUOROETHYLENE, INHIBITED

Common Synonyms			
Teflon monomer	Compressed Gas	Colorless	Odorless or faint odor
	Visible vapor cloud is produced		

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat

Water Pollution

Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Teflon monomer
3 2 **Coast Guard Compatibility Classification.** Not applicable
3 3 **Chemical Formula** $F_2C=CF_2$
3 4 **IMCO/United Nations Numerical Designation.** 2 [illegible]61

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Compressed gas
4 2 **Color:** Colorless
4 3 **Odor:** None or faint

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus for high gas concentrations
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory system. Contact with eyes causes slight irritation
5 3 **Treatment for Exposure:** INHALATION: remove victim from exposure; if breathing is difficult give artificial respiration and call physician
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Lab Toxicity:** Causes possible impairment of immunological and defense systems in rats
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (gas)
6 2 **Flammable Limits in Air:** 10% [illegible]
6 3 **Fire Extinguishing Agents:** Let fire burn; stop flow of gas; cool containers with water
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** When burned in air, gas forms toxic carbonyl fluoride and hydrogen fluoride
6 6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode
6 7 **Ignition Temperature:** 470 F
6 8 **Electrical Hazard:** Class [illegible]. Air mixtures produced explosions which propagated through the smallest clearance in a standard test conducted by Underwriters Laboratories. It does not meet any group classification.

Continued on page 4

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Can polymerize in the absence of inhibitor, especially when heated or in presence of oxygen
7 6 **Inhibitor of Polymerization.** d limonene, pinene, tetrahydronaphthalene, [illegible] methyl methacrylate

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** None
8 2 **Waterfowl Toxicity:** None
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 E I duPont de Nemours & Co
Plastics Department
Wilmington, Del. 19898

2 ICI America
Wilmington, Del. 19899

3 Matheson Gas Products Co
East Rutherford, N J 07073

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** 98+%
10 2 **Storage Temperature:** Cool, ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C /

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable compressed gas
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification*	
Health Hazard (Blue)	2	3
Flammability (Red)	4	4
Reactivity (Yellow)	[illegible]	3

*First column refers to nonfire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas
13 2 **Molecular Weight:** 100.0
13 3 **Boiling Point at 1 atm:** −105°F = −76°C = 197°K
13 4 **Freezing Point.** −224°F = −142°C = 131°K
13 5 **Critical Temperature:** (est.) 92°F = 33°C = 306°K
13 6 **Critical Pressure:** (est.) [illegible] psia = 38 atm = 3.85 MN/m²
13 7 **Specific Gravity:** Not pertinent
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 3.48
13 11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.1261
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** (est.) −4 000 Btu/lb = −2 000 cal/g = −90 × 10³ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** −450 Btu/lb = −250 cal/g = −10.5 × 10³ J/kg

Continued on pages 5 and 6

6 FIRE HAZARDS (Cont'd.)

6 9 **Burning Rate:** Not pertinent

THF — TETRAHYDROFURAN

Common Synonyms
Oxtrahexene oxide
Tetramethylene oxide
THF

Liquid | Colorless | Faint fruity odor

Floats and mixes with water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, headache or loss of consciousness.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

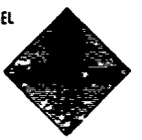
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning. High flammability.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Tetramethylene oxide; THF
3.2 **Coast Guard Compatibility Classification** Ether
3.3 **Chemical Formula** C_4H_8O
3.4 **IMCO United Nations Numerical Designation.** 3.1 2056

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ether-like; similar to acetone

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Self-contained breathing apparatus; protective clothing of rubber or plastic gloves.

5.2 **Symptoms Following Exposure.** Vapor causes nausea, dizziness, headache, irritation of eyes, nose and throat; loss of consciousness. Liquid is irritating to the skin and eyes; harmful if swallowed.

5.3 **Treatment for Exposure:** INHALATION: remove victim to uncontaminated area; if breathing has stopped, give artificial respiration and oxygen. Do not use mouth-to-mouth method. INGESTION: give large quantities of water; induce vomiting; call physician immediately. Do not give anything by mouth to an unconscious person. Keep victim warm and quiet. SKIN OR EYE CONTACT: flush with plenty of water for at least 15 minutes. Get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** 200 ppm

5.5 **Short-Term Inhalation Limits.** [illegible] 300 ppm

5.6 **Toxicity by Ingestion.** Grade 1 LD50 = 1.0 g/kg

5.7 **Late Toxicity:** Data not available.

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes slight smarting of eyes and respiratory tract at 200 ppm; severe irritation at high concentrations. Effects are temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum irritant. Repeated or prolonged contact may cause smarting and reddening of the skin.

5.10 **Odor Threshold.** 50 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** -14°F (C.C.) = -4°F (O.C.)
6.2 **Flammable Limits in Air.** 1.8% - 11.8%
6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide.
6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective.
6.5 **Special Hazards of Combustion Products.** Irritating vapor is generated when heated.
6.6 **Behavior in Fire.** May explode. Vapor is heavier than air and may travel considerable distance to source of ignition and flash back.
6.7 **Ignition Temperature.** 610°F
6.8 **Electrical Hazard.** Not pertinent.
6.9 **Burning Rate.** 4.7 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.** No reaction
7.3 **Stability During Transport.** Stable unless 0.1% of peroxides has accumulated because of prolonged storage in presence of air. When concentrated by evaporation of solution, may explode.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** 0.02% butylated hydroxytoluene (BHT) prevents peroxide formation.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD).** Data not available.
8.4 **Food Chain Concentration Potential.** None.

9 SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Inc.
Electrochemicals Dept.
Wilmington, Del. 19898

2. The Quaker Oats Co.
Chemical Division
3224 Chelsea Ave.
Memphis, Tenn. 38108

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Data not available.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Padded
10.4 **Venting.** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

VAPORS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classification.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 72.10
13.3 **Boiling Point at 1 atm:**
151°F = 66°C = 339°K
13.4 **Freezing Point:**
-163.3°F = -108.5°C = 164.7°K
13.5 **Critical Temperature:**
512.6°F = 267.0°C = 540.2°K
13.6 **Critical Pressure:**
753 psia = 51.2 atm = 5.19 MN/m²
13.7 **Specific Gravity:** 0.888 at 20°C (liquid)
13.8 **Liquid Surface Tension**
26 dynes/cm = 0.026 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).**
1.031 (70°F)
13.12 **Latent Heat of Vaporization**
190 Btu/lb = 99 cal/g = 4.1 × 10⁵ J/kg
13.13 **Heat of Combustion.** -14,500 Btu/lb
= -8330 cal/g = -34.8 × 10⁵ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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THN — TETRAHYDRONAPHTHALENE

Common Synonyms
1,2,3,4-tetrahydronaphthalene
Tetralin
tetrasap

Water-white liquid. Colorless. Mothballs/turpentine odor.

Floats on water.

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-1

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2,3,4-Tetrahydronaphthalene; Tetralin; Tetrasap

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_{10}H_{12}$

3.4 **IMCO United Nations Numerical Designation:** Not assigned

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild characteristic odor resembling that of naphthalene or turpentine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** A supplied-air respirator with full facepiece, chemical-resistant gloves, and chemical-resistant clothing

5.2 **Symptoms Following Exposure:** Liquid irritates eyes and skin. Inhalation may cause irritation of respiratory tract and narcosis at high concentrations

5.3 **Treatment for Exposure:** INGESTION: Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention. SKIN: Wash with soap and water. EYES: Flush with water for 15 minutes and get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not established

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. Dose not given

5.7 **Late Toxicity:** Liver and kidney damage in animals

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is irritating to eyes, nose, and respiratory system at high concentrations. Headache, confusion

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Repeated contact with skin may cause irritation and dermatitis. Prolonged contact may cause a burning sensation and blistering. Irritating to eyes

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 160°F (71°C) TOC, 154°F (68°C) PMCC

6.2 **Flammable Limits in Air:** 0.8% - 5.0%

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 385°F (196°C)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 78 ppm/24 hr/brine shrimp/21°C

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0.0% in 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

E. I. duPont de Nemours & Co., Inc.
Organic Chemicals Dept.
Wilmington, Delaware

Hercules, Inc.
Chemical Sales
Hercules Tower
Wilmington, Delaware 19894

Koppers Company, Inc.
Organic and Plastics Div.
2900 Koppers Bldg.
Pittsburgh, Pennsylvania 15219

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 97%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Not required

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

A.F.I.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poison	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Liquid

13.2 **Molecular Weight:** 132.2

13.3 **Boiling Point at 1 atm.:** 406°F = 208°C = 481°K

13.4 **Freezing Point:** -23.8°F = -31°C = 242°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.973 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 30.7 dynes/cm = 0.0307 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 155 Btu/lb = 86.1 cal/g = 3.60 × 10⁵ J/kg

13.13 **Heat of Combustion:** -17,900 Btu/lb = -10,200 cal/g = -429 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued next page

NOTES

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TML	TETRAMETHYL LEAD

Common Synonyms
Lead tetramethyl

Oily liquid | Colorless | Fruity odor

Sinks in water. Poisonous flammable vapor is produced

Fire

Combustible
Containers may explode in fire
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Evacuate downwind
Restrict access
Notify fire control
Chemical/physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Lead tetramethyl
3.2 Coast Guard Compatibility Classification: Specific class
3.3 Chemical Formula: $Pb(CH_3)_4$
3.4 IMCO United Nations Numerical Designation: 6.1/1649

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Practically colorless
4.3 Odor: Fairly strong odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Organic vapor cartridge respirator with full facepiece. Impervious clothing. Safety shoes. Eye protection. Avoid skin contact.

5.2 Symptoms Following Exposure: Causes central nervous system disorders. Symptoms may include headache, dizziness, nausea, vomiting, abdominal pain, diarrhea, and bloody urine. Damage to liver and kidneys.

5.3 Treatment for Exposure: Remove victim from area. Remove contaminated clothing. Wash skin with soap and water. Keep victim warm and quiet. Get medical attention.

5.4 Toxicity by Inhalation (Threshold Limit Value): 0.075 mg/m³

5.5 Short-Term Inhalation Limits: Data not available

5.6 Toxicity by Ingestion: Grade 3, oral rat LD_{50} = 109 mg/kg

5.7 Late Toxicity: Teratogenic

5.8 Vapor (Gas) Irritant Characteristics: Vapor causes slight smarting of eyes. Liquid splashed in eyes causes severe pain which may cause temporary blindness.

5.9 Liquid or Solid Irritant Characteristics: Causes smarting of eyes and skin. Liquid on skin causes severe pain and dries skin by defatting action.

5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 Flash Point: 80 F OC
6.2 Flammable Limits in Air: Data not available
6.3 Fire Extinguishing Agents: Water fog. Alcohol foam. Carbon dioxide. Dry chemical.
6.4 Fire Extinguishing Agents Not to be Used: Not applicable
6.5 Special Hazards of Combustion Products: Poisonous fumes of lead oxides
6.6 Behavior in Fire: Not applicable
6.7 Ignition Temperature: Data not available
6.8 Electrical Hazard: Not applicable
6.9 Burning Rate: Data not available

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable. Polymerization may occur if exposed to sunlight or ultraviolet light.
7.4 Neutralizing Agents for Acids and Caustics: Not applicable
7.5 Polymerization: Not applicable
7.6 Inhibitor of Polymerization: Not applicable

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: Data not available

9 SELECTED MANUFACTURERS

Ethyl Corp
Ethyl Corp of Canada
Houston Chemical Div
Baton Rouge Lab
Ethyl Antoine Ltd
Ethyl Corp Houston Div
Nalco Chemical Co
PPG Industries
Houston Chemical Div
Baton Rouge Lab

10 SHIPPING INFORMATION

10.1 Grades of Purity: Technical
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Pressure/vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

1 x 3

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Poisonous liquids, Oral Class B
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 253.33
13.3 Boiling Point at 1 atm: 200 F = 93 C = 366 K
13.4 Freezing Point: -24 F = -31 C = 242 K
13.5 Critical Temperature: Not available
13.6 Critical Pressure: Not available
13.7 Specific Gravity: 1.999 at 20°C (liquid)
13.8 Liquid Surface Tension: Data not available
13.9 Liquid-Water Interfacial Tension: Data not available
13.10 Vapor (Gas) Specific Gravity: Not available
13.11 Ratio of Specific Heats of Vapor (Gas): Not available
13.12 Latent Heat of Vaporization: Not available
13.13 Heat of Combustion: Not available
13.14 Heat of Decomposition: Not available
13.15 Heat of Solution: Not available
13.16 Heat of Polymerization: Not available

Continued on page 2

NOTES

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TPG THIOPHOSGENE

Common Synonyms			
Thiocarbonyl chloride	Liquid	Red	Sharp choking odor

Sinks in water. Reacts slowly with water and produces poisonous vapor.

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat.

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Hazardous Materials Handbook, CG-446-4

Issue warning. Poison if contaminates water contaminated.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Thiocarbonyl chloride
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula:** $CSCl_2$
3.4 **IMCO/United Nations Numerical Designation:** 6.1

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Red
4.3 **Odor:** Choking very irritating sharp

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus; organic vapor canister; goggles or face shield; rubber gloves.
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory system; delayed pulmonary edema. Vapor irritates eyes. Liquid dehydrates and irritates skin. Ingestion causes irritation of mouth and stomach.
5.3 **Treatment for Exposure:** *Get medical attention at once after any exposure to this compound.* INHALATION: remove victim from exposure, support respiration, watch for pulmonary edema. EYES: irrigate with large quantities of water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amounts of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** Data not available
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents.** Dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6.5 **Special Hazards of Combustion Products:** Toxic phosgene, hydrogen chloride and sulfur dioxide may be generated in a fire.
6.6 **Behavior in Fire:** Decomposes above 200°C; carbon bisulfide vapors flammable; and carbon tetrachloride.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Reacts to form hydrogen chloride, carbon dioxide and carbon disulfide. Reaction is slow unless water is hot.
7.2 **Reactivity with Common Materials.** Corrodes metals in presence of moisture.
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water; rinse with sodium bicarbonate or lime solution.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

9.1 Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

9.2 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vent

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446)

XOXY

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 114.9
13.3 **Boiling Point at 1 atm:**
[illegible]°F = 73°C = 346°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.5 at 20°C
13.8 **Liquid Surface Tension.** (est.)
25 dynes/cm = 0.025 N/m at 25°C
13.9 **Liquid-Water Interfacial Tension:**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4
13.11 **Ratio of Specific Heats of Vapor (Gas).**
Data not available
13.12 **Latent Heat of Vaporization** (est.)
[illegible] Btu/lb = [illegible] cal/g
= 3.0 × 10[illegible] J/kg
13.13 **Heat of Combustion.** (est.)
−1400 Btu/lb = −780 cal/g
= −90 × 10[illegible] J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5-60.A

NOTES

THR THIRAM

Common Synonyms
Bis(dimethylthiocarbamoyl) disulfide
Bis(dimethylthiocarbamoyl) disulfide
Tetramethylthiuram disulfide

Solid — White to light yellow

Sinks in water

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Poilution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Issue warning - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

Hazard and [illegible] Coast Guard Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Arasan, Bis(dimethylthio carbamoyl) disulfide, Bis(dimethylthiocarbamoyl) disulfide, Methylthiram, Methylthiuram, Tetramethylthiuram disulfide, Thiuram

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:**
$(CH_3)_2NCSSSCSN(CH_3)_2$
$C_6H_{12}N_2S_4$

(continued on page 2)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White to slight yellow
4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles, dust mask

5.2 **Symptoms Following Exposure:** Inhalation of dust may cause respiratory irritation. Liquid irritates eyes and skin and may cause allergic eczema in sensitive individuals. Ingestion causes nausea, vomiting and diarrhea, all of which may be persistent; paralysis may develop.

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure. If breathing has stopped or is difficult, give artificial respiration and call physician. EYE or SKIN: wash with water for 15 minutes; if irritation persists, consult a physician. INGESTION: call physician; induce vomiting and follow with gastric lavage. Treatment thereafter is symptomatic and supportive. As sulfasuxidic and lipid solvents which enhance absorption, liquor should be prohibited. Observation for at least 10 days is recommended. Caution has used as short as 48 hrs.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Rat oral LD_{50} [illegible] mg/kg; mouse oral [illegible] mg/kg

5.7 **Late Toxicity:** Carcinogenic data: none reported; mutagenic data: none reported

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic sulfur oxides (sulfur dioxide are formed. Carbon disulfide is produced in unconfined material.

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.06 ppm/96 hr/rainbow trout/flow, fresh water

8.2 **Waterfowl Toxicity:** [illegible] mg/kg

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Pennwalt Corporation
Chemicals Division
Three Parkway
Philadelphia, Pa. 19102

2. E I duPont de Nemours & Co
Wilmington, Del. 19898

3. R T Vanderbilt Co., Inc.
230 Park Avenue
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 95% min 2% wet

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 240.4

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:**
[illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.43 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(continued on page 3)

3 CHEMICAL DESIGNATIONS (Cont'd)

3.4 **IMCO/United Nations Numerical Designation:** 2771/1709

TRN	# THORIUM NITRATE

Common Synonyms			
Thorium nitrate tetrahydrate	Solid	White	Odorless
	Mixes with water		

Fire	Not flammable May cause fire on contact with combustibles POISONOUS GASES ARE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat Harmful if inhaled SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-6)

Issue warning. Isolate or ventilate area. Keep material out of water. Contain runoff. Restrict access. Should be removed. Chemical and physical treatment.

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Thorium nitrate tetrahydrate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $Th(NO_3)_4 \cdot 4H_2O$ (approx.)

3.4 **IMCO/United Nations Numerical Designation:** Data not available

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, gloves, rubber shoes, rubber apron.

5.2 **Symptoms Following Exposure:** Compound has low chemical toxicity. Not alpha emitter expected to constitute a hazard. Contains large amount is absorbed or ingested. Dust may irritate eyes and cause diffuse dermatitis. Beta and gamma emission is small.

5.3 **Treatment for Exposure:** EYES: flush with water and consult physician. SKIN: wash thoroughly with soap and water. INGESTION: get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Genetic effects of radionuclides involved are suspected to be harmful.

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable. Reacts violently with combustibles.

6.2 **Flammable Limits in Air:** Not flammable.

6.3 **Fire Extinguishing Agents:** Water.

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.

6.5 **Special Hazards of Combustion Products:** Yields toxic gases under fire conditions.

6.6 **Behavior in Fire:** When heated, may decrease in weight. Fire in area may cause material to decompose, releasing toxic gases. Water used to extinguish fire may result in contaminated runoff.

6.7 **Ignition Temperature:** Not pertinent.

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** Not pertinent.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms a weak solution. Reaction with water is not hazardous.

7.2 **Reactivity with Common Materials:** In contact with easily oxidizable substances may react vigorously enough to cause ignition under certain conditions. Explosive mixtures may be formed with powdered metals.

7.3 **Stability During Transport:** Stable.

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 1000 ppm/24 hr/fish/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

W. R. Grace & Co.
Davison Chemical Division
P.O. Box 191
Pompton Plains, N.J. 07444

American Potash & Chemical Corp.
Industrial Chemicals Division
2700 Ann Street
West Chicago, Illinois 60185

J.T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

NN

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Radioactive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0
	W

*Extreme = 4; Slight = 0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 552.12

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent.

13.5 **Critical Temperature:** Not pertinent.

13.6 **Critical Pressure:** Not pertinent.

13.7 **Specific Gravity:** 2.8 at 20°C/4°C

13.8 **Liquid Surface Tension:** Not pertinent.

13.9 **Liquid-Water Interfacial Tension:** Not pertinent.

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.

13.12 **Latent Heat of Vaporization:** Not pertinent.

13.13 **Heat of Combustion:** Not pertinent.

13.14 **Heat of Decomposition:** Not pertinent.

13.15 **Heat of Solution:** Not pertinent.

13.16 **Heat of Polymerization:** Not pertinent.

(continued on next page)

NOTES

TTT	# TITANIUM TETRACHLORIDE

Common Synonyms	Watery liquid Colorless to light yellow Irritating odor Reacts violently with water. Produces dense fumes in air
Fire	Not flammable
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or headache LIQUID Will burn skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2 LABEL



3 CHEMICAL DESIGNATIONS

- 3.1 Synonyms:
- 3.2 Coast Guard Compatibility Classification:
- 3.3 Chemical Formula: $TiCl_4$
- 3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

- 4.1 Physical State (as shipped).
- 4.2 Color:
- 4.3 Odor:

5 HEALTH HAZARDS

- 5.1 Personal Protective Equipment:
- 5.2 Symptoms Following Exposure:
- 5.3 Treatment for Exposure:
- 5.4 Toxicity by Inhalation (Threshold Limit Value)
- 5.5 Short-Term Inhalation Limits:
- 5.6 Toxicity by Ingestion.
- 5.7 Late Toxicity: Disturbances of upper respiratory and nervous system in man
- 5.8 Vapor (Gas) Irritant Characteristics:
- 5.9 Liquid or Solid Irritant Characteristics:
- 5.10 Odor Threshold:

6 FIRE HAZARDS

- 6.1 Flash Point:
- 6.2 Flammable Limits in Air:
- 6.3 Fire Extinguishing Agents:
- 6.4 Fire Extinguishing Agents Not to be Used:
- 6.5 Special Hazards of Combustion Products:
- 6.6 Behavior in Fire:
- 6.7 Ignition Temperature:
- 6.8 Electrical Hazard:
- 6.9 Burning Rate:

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water:
- 7.2 Reactivity with Common Materials:
- 7.3 Stability During Transport:
- 7.4 Neutralizing Agents for Acids and Caustics:
- 7.5 Polymerization.
- 7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity:
- 8.2 Waterfowl Toxicity:
- 8.3 Biological Oxygen Demand (BOD):
- 8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

- *10.1 Grades of Purity: Technical
- *10.2 Storage Temperature: Ambient
- *10.3 Inert Atmosphere:
- *10.4 Venting: Pressure-Vacuum

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

- *12.1 Code of Federal Regulations:
- *12.2 NAS Hazard Rating for Bulk Water Transportation.

Category	Rating

- *12.3 NFPA Hazard Classifications

Category	Classification

13 PHYSICAL AND CHEMICAL PROPERTIES

- *13.1 Physical State at 15°C and 1 atm:
- *13.2 Molecular Weight:
- *13.3 Boiling Point at 1 atm:
- *13.4 Freezing Point:
- *13.5 Critical Temperature:
- *13.6 Critical Pressure:
- *13.7 Specific Gravity:
- 13.8 Liquid Surface Tension:
- *13.9 Liquid-Water Interfacial Tension.
- *13.10 Vapor (Gas) Specific Gravity:
- *13.11 Ratio of Specific Heats of Vapor (Gas):
- *13.12 Latent Heat of Vaporization.
- *13.13 Heat of Combustion:
- *13.14 Heat of Decomposition.
- *13.15 Heat of Solution:
- *13.16 Heat of Polymerization.

NOTES

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TOL	# TOLUENE

Common Synonyms
Toluol
Methylbenzene
Methylbenzol

Watery liquid | Colorless | Pleasant odor

Floats on water. Flammable. Irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting or loss of consciousness.

DO NOT INDUCE VOMITING

Water Pollution

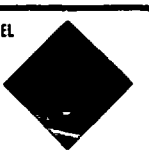
Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See *Response Methods Handbook*, CG-446-4)

Issue warning: high flammability.
Evacuate area.

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Methylbenzene, Methylbenzol, Toluol
3 2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon
3 3 **Chemical Formula:** C_7H_8
3 4 **IMCC/United Nations Numerical Designation:** 3 2 1294

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Pungent aromatic benzene-like, distinct, pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air-supplied mask, goggles or face shield, plastic gloves
5 2 **Symptoms Following Exposure:** Vapors irritate eyes and upper respiratory tract, cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested, causes vomiting, griping, diarrhea, depressed respiration.
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air, give artificial respiration and oxygen if needed, call a doctor. INGESTION: do NOT induce vomiting, call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5 5 **Short-Term Inhalation Limits:** 600 ppm for 30 min
5 6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg
5 7 **Late Toxicity:** Kidney and liver damage may follow ingestion
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5 10 **Odor Threshold:** 0.17 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 40°F (C.C.) 4.5°C
6 2 **Flammable Limits in Air:** 1.27 - 7.0%
6 3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, ordinary foam for large fires
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back
6 7 **Ignition Temperature:** 997°F
6 8 **Electrical Hazard:** Class I, Group D
6 9 **Burning Rate:** 3.7 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 1180 mg/l 96-hr sunfish/TL_m fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** 0.7, 3 days, 35% (theor.), 8 days
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston, Tex. 77001

2 Shell Chemical Co
Petrochemicals Division
Houston, Tex. 77001

3 Sun Oil Co
St. Davids, Pa. 19087

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Research reagent, nitration, all 99.8+%; industrial contains 94+% with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90-120° less pure than industrial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open flame arrester or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See *Hazard Assessment Handbook*, CG-446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 92.14
13 3 **Boiling Point at 1 atm:** 231.1°F = 110.6°C = 383.8°K
13 4 **Freezing Point:** −139°F = −95.0°C = 178.2°K
13 5 **Critical Temperature:** 605.4°F = 318.6°C = 591.8°K
13 6 **Critical Pressure:** 596 psia = 40.55 atm = 4.108 MN/m²
13 7 **Specific Gravity:** 0.867 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 29.0 dynes/cm = 0.0290 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** 36.1 dynes/cm = 0.0361 N/m at 25°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.089
13 12 **Latent Heat of Vaporization:** 155 Btu/lb = 86 cal/g = 3.6 × 10⁵ J/kg
13 13 **Heat of Combustion:** −17,430 Btu/lb = −9686 cal/g = −405.8 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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TDI — TOLUENE 2,4-DIISOCYANATE

Common Synonyms
TDI
Hylene T
Mondur TDS
Naccanate 100

Liquid — Colorless to light yellow — Sharp, sweet fruity odor

Sinks and reacts with water. Freezing point is 68°F = 72°F

AVOID CONTACT WITH LIQUID AND VAPOR. Keep upwind. Keep away
Wear goggles, self-contained breathing apparatus and chemical protective clothing, including gloves.
Stay away from low areas.
Call for assistance.
Isolate and deny entry to unprotected personnel.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GAS IS PRODUCED IN FIRE
Wear goggles, self-contained breathing apparatus and chemical protective clothing, including gloves.
Extinguish with dry chemical, CO2, sand or earth.
Water and foam may be ineffective on fire.
Dike exposed containers with earth.

Exposure

CALL FOR MEDICAL AID
LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
Remove contaminated clothing at once.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids apart and flush eyes with water.
IF SWALLOWED, induce VOMITING by touching back of throat with finger.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Hylene T, Mondur TDS, Naccanate 100, 2,4-Tolylene diisocyanate, TDI
3 2 **Coast Guard Compatibility Classification:** Isocyanate
3 3 **Chemical Formula:** $C_6H_3(CH_3)(NCO)_2$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless to light yellow
4 3 **Odor:** Sweet, fruity, pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor canister, goggles or face shield, rubber gloves, boots and apron
5 2 **Symptoms Following Exposure:** Irritates eyes and skin. Potent sensitizer and lung irritant if inhaled. May produce bronchospasm (asthma), pneumonitis, bronchitis, and pulmonary edema. Nocturnal cough and shortness of breath are common. Repeated low level exposure may produce chronic lung disease. Oral toxicity is low.
5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, administer artificial respiration and oxygen if needed, call a doctor at once. INGESTION: do NOT induce vomiting, call a doctor. EYES: flush with water for at least 15 min., call doctor at once. SKIN: flush with water, wipe off, wipe with rubbing alcohol, wash with soap and water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.02 ppm
5 5 **Short-Term Inhalation Limits:** 0.02 ppm for 5 min
5 6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
5 9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant, may cause pain and second degree burns after a few minutes' contact.
5 10 **Odor Threshold:** 0.4 - 2.14 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 270°F O.C.
6 2 **Flammable Limits in Air:** 0.9% - 9.5%
6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** >800°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Forms carbon dioxide gas and an organic base; the reaction is not violent
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Slow, not hazardous above 113°F
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 BASF Wyandotte Corp.
Industrial Chemicals Group
1609 Biddle Ave.
Wyandotte, Mich. 48192

2 Bayhem Corp.
Mobay Chemical Co. Division
Penn-Lincoln Pkwy. West
Pittsburgh, Pa. 15205

3 E. I. duPont de Nemours & Co., Inc.
Elastomer Chemicals Dept.
Wilmington, Del. 19898

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial, distilled, 99% total diisocyanate. The following isomer ratios are shipped: (a) 100% 2,4; (b) 80% 2,4 - 20% 2,6- (most common); (c) 65% 2,4 - 35% 2,6- All mixtures have about the same hazard characteristics.
10 2 **Storage Temperature:** 75° - 100°F
10 3 **Inert Atmosphere:** Inerted
10 4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poison, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	
Aesthetic Effect	4
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 174.16
13 3 **Boiling Point at 1 atm.:** 482°F = 250°C = 523°K
13 4 **Freezing Point:** 68 - 72°F = 20 - 22°C = 293 - 295°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.22 at 25°C (liquid)
13 8 **Liquid Surface Tension:** test 120 dynes/cm = 0.025 N/m at 25°C
13 9 **Liquid-Water Interfacial Tension:** test 145 dynes/cm = 0.045 N/m at 25°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** (est.) -10,300 Btu/lb = -5720 cal/g = -239 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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TAP — p-TOLUENESULFONIC ACID

Common Synonyms			
Methylbenzenesulfonic acid Tosic acid p-TSA	Solid	Colorless to black	Odorless or slight odor
	Mixes with water		

Fire

Combustible
Irritating gases may be produced when heated

Exposure

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - corrosive
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Methylbenzenesulfonic acid, Tosic acid, p-TSA
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $CH_3C_6H_4SO_3H$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White to brown to black, yellow or amber
4 3 **Odor:** None when pure, technical grade has slight aromatic odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Contact with eyes or skin causes severe irritation. Ingestion causes irritation of mouth and stomach
5 3 **Treatment for Exposure:** EYES: wash thoroughly with copious amounts of water for at least 15 min., call physician if irritation persists. SKIN: wash thoroughly with large amounts of water for at least 15 min. INGESTION: give large amount of water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 400 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (solid with low flammability)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur may be formed
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** A strong acid which can react with common metals
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with dilute sodium bicarbonate or lime solution
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available.
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** 0% 5 days
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Cities Service Company
Industrial Chemicals Division
3445 Peachtree Road N E
P O Box 90360
Atlanta Ga 30302

2 Neave Chemical Co Inc
P O Box 221
State College, Pa 16801

3 Aldrich Chemical Co
940 West St Paul Avenue
Milwaukee Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 93+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 172.2
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** 219 - 221°F = 104 - 105°C = 377 - 378°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.45 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** -50 Btu/lb = -28 cal/g = -1.2 × 10^5 J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

TLI

o-TOLUIDINE

Common Synonyms
2-Amino-1-methylbenzene
2-Aminotoluene
2-Methylaniline
o-Methylaniline

Liquid | Colorless to yellow brown | Chemical odor

May float or sink in water

[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

[illegible]

Exposure

• AIHA ERG Medical Alert
LIQUID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

[illegible]

Water Pollution

Effect of low concentrations on aquatic life unknown
Fouling to shoreline
May be dangerous if it enters water intake

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Coast Guard Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2-Amino-1-methylbenzene, 2-Aminotoluene, 2-Methylaniline, o-Methylaniline

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $1,2\ CH_3C_6H_4NH_2$

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1708

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Clear to light yellow, turns yellow, brown or deep red on exposure to air and light

4 3 **Odor:** Aromatic, aniline like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical safety goggles, face shield, Bu Mines approved respirator, leather or rubber safety shoes, butyl rubber gloves

5 2 **Symptoms Following Exposure:** Absorption of toxic quantities by any route causes cyanosis (blue discoloration of lips, nails, skin), nausea, vomiting, and coma may follow. Repeated inhalation of low concentrations may cause pallor, low grade secondary anemia, fatigability, and loss of appetite. Contact with eyes causes irritation.

5 3 **Treatment for Exposure:** Get medical attention following all exposures to this compound. INHALATION: move to fresh air. INGESTION: if victim is conscious, promptly induce vomiting by giving luke warm soapy water or mustard and water. EYES: flush with copious amounts of water for at least 15 min, holding lids apart. SKIN: remove all contaminated clothing, wash affected areas immediately and thoroughly with plenty of warm water and soap.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2; rat LD_{50} = 800 mg/kg (rat)

5 7 **Late Toxicity:** Causes tumors of urinary bladder of rats

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 107°F (CC), 85°F (CC)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and flammable vapors may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 900°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 3.62 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 30 ppm/* fresh lethal/fresh water
* Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 143% 5 days

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 First Chemical Corp
636 N State St
Jackson, Miss 39205

2 E I du Pont de Nemours & Co Inc
Wilmington, Del 19898

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee, Wis 53233

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99.5+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3.

A-P Q T U-N Y

12. HAZARD CLASSIFICATIONS

*2 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 107.2

13 3 **Boiling Point at 1 atm:** 392°F = 200°C = 473°K

13 4 **Freezing Point:** −11°F = −24°C = 249°K

13 5 **Critical Temperature:** 790°F = 421°C = 694°K

13 6 **Critical Pressure:** 544 psia = 37.0 atm = 3.75 MN/m²

13 7 **Specific Gravity:** 0.998 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 43.55 dynes/cm = 0.04355 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 179.1 Btu/lb = 99.5 cal/g = 4.16 × 10⁵ J/kg

13 13 **Heat of Combustion:** −16 180 Btu/lb = −9 990 cal/g = −376 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

TXP	# TOXAPHENE

Common Synonyms
Octachlorocamphene

Waxy solid or in solution — Amber

Solid sinks in water; solution floats on water

[illegible]

Fire

Solid not flammable, but usually dissolved in combustible liquid.
POISONOUS GASES ARE PRODUCED IN FIRE
[illegible]

Exposure

CALL FOR MEDICAL AID
SOLID OR SOLUTION
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
[illegible]
IF SWALLOWED [illegible] INDUCE VOMITING OR HAVE VICTIM DRINK LARGE AMOUNTS OF WATER and warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Solution is fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning: poison, water contaminant
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Octachlorocamphene
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $C_{10}H_{10}Cl_8$
3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Waxy solid
4 2 **Color:** Amber
4 3 **Odor:** Mild turpentine odor

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical type respirator, rubber gloves, chemical goggles or face shield

5 2 **Symptoms Following Exposure:** May be absorbed through skin. Lungs or intestinal tract. Symptoms include salivation, leg and back muscle spasms, nausea, vomiting, hyperexcitability, tremors, shivering, clonic convulsions, then tetanic contractions of all skeletal muscles. Lethal doses cause respiratory failure. Respiration affected as a result of the exertion from vomiting or convulsions is not affected because of tetanic muscular contractions; then increased in both amplitude and rate as the muscles relax.

5 3 **Treatment for Exposure:** If symptoms of poisoning appear, promptly remove the unabsorbed pesticide from the stomach by induced vomiting with warm salts or soapy water (if the patient is conscious) or from the skin with soap and water. Keep patient warm and quiet. Call a physician.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 4. 1 Dr. below 50 mg/kg (dog)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** The solid is non-volatile. For solutions, see metaxylene

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on skin, wipe and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 54°F C.C. (solution)
6 2 **Flammable Limits in Air:** 1.1 - 6.4 % (by vol.)
6 3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated
6 6 **Behavior in Fire:** Solution in xylene may produce corrosive products when heated
6 7 **Ignition Temperature:** 990°F (solution)
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Not reactive
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.05 ppm, 20 days, goldfish/100% kill, fresh water
0.02 ppm * bluegill/100% kill, fresh water
0.0032 ppm, 24 hr spot/100% kill, salt water
* Time period not specified

8 2 **Waterfowl Toxicity:** 30 mg/kg
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Hercules Inc.
Synthetics Dept.
Brunswick, Ga. 31521

2 Sunbelt Chemical Co.
Pure Atlanta Highway
Port Neches, Tex. 77651

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, 40% dust concentrate, 90% solution in xylene
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Sealed containers in well-ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-2)

H A T E

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Waxy solid
13 2 **Molecular Weight:** 414 (avg.)
13 3 **Boiling Point at 1 atm:** Decomposes
13 4 **Freezing Point:** 149 - 194°F = 65 - 90°C = 338 - 363°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** [illegible]
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6

NOTES

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TCE | TRICHLOROETHANE

Common Synonyms
1 1 1 Trichloroethane
Methylchloroform

Watery liquid | Colorless | Sweet odor

Sinks in water. Irritating vapor is produced.

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause dizziness or difficult breathing.

LIQUID
Irritating to skin and eyes.
If swallowed may produce nausea.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Hazardous Materials Spill Guide, CG 446-4)

Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Acetylene Chlorothene
Methyl chloroform
1 1 1 Trichloroethane

3 2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3 3 **Chemical Formula:** CH_3CCl_3

3 4 **IMCO United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Chloroform like, sweetish

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor acid gas canister self-contained breathing apparatus for emergencies neoprene or polyvinyl alcohol tight gloves chemical safety goggle and face shield, neoprene safety boots leather safety shoes plus neoprene footwear neoprene or polyvinyl alcohol suit or apron for splash protection

5 2 **Symptoms Following Exposure:** INHALATION symptoms range from loss of equilibrium and incoordination to loss of consciousness high concentrations can be fatal due to simple asphyxiation combined with loss of consciousness INGESTION produces effects similar to inhalation and may cause some feeling of nausea EYES sight is irritating and lachrymatory SKIN defatting action may cause dermatitis

5 3 **Treatment for Exposure:** Get medical attention for all eye exposures and any other serious over exposures Do NOT administer adrenalin or epinephrine otherwise, treatment is symptomatic INHALATION remove victim to fresh air if necessary, apply artificial respiration and or administer oxygen INGESTION have victim drink water and induce vomiting EYES flush thoroughly with water SKIN remove contaminated clothing and wash exposed area thoroughly with soap and warm water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 350 ppm

5 5 **Short-Term Inhalation Limits:** 1000 ppm for 60 min in man

5 6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ 5 to 15 g/kg (rat, mouse, rabbit, guinea pig)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

(Continued on page 4)

6. FIRE HAZARDS

6 1 **Flash Point:** Data not available

6 2 **Flammable Limits in Air:** ? %

6 3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic and irritating gases are generated in fires

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 932°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** (est.) 2.9 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly releasing corrosive hydrochloric acid

7 2 **Reactivity with Common Materials:** Corrodes aluminum but reaction is not hazardous

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 75–150 ppm / 96 hr / sunfish / TLm / salt water / *Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich. 48640

2 PPG Industries, Inc.
Industrial Chemicals Division
Fourteen Gateway Center
Pittsburgh, Pa. 15222

3 Vulcan Materials Co
Chemicals Division
Wichita, Kan. 67201

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Uninhibited, inhibited, industrial inhibited, white room cold cleaning

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 133.41

13 3 **Boiling Point at 1 atm:** 165°F = 74°C = 347°K

13 4 **Freezing Point:** <–31°F = <–35°C = <238°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.34 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 25.4 dynes/cm = 0.0254 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 4.6

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.064

13 12 **Latent Heat of Vaporization:** 100 Btu/lb = 55 cal/g = 2.4 × 10^5 J/kg

13 13 **Heat of Combustion:** (est.) 4700 Btu/lb = 2600 cal/g = 110 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 4)

5. HEALTH HAZARDS (Cont'd.)

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** 100 ppm

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TCL TRICHLOROETHYLENE

Common Synonyms
Trichloroethene
Trichlene

Watery liquid | Colorless | Sweet odor

Sinks in water. Irritating vapor is produced.

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, vomiting, difficult breathing or loss of consciousness.

LIQUID
Irritating to skin and eyes
If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Algylen, Chlorylen, Gemalgene, Trethylene, Trethylene Tri, Trichloran, Trichloroethene, Tri Clene, Trelene, Trilene, Triline, Trimar

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:** $ClHC{=}CCl_2$

3.4 **IMCO/United Nations Numerical Designation:** 9.0 1710

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Chloroform like, ethereal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor acid gas canister, self-contained breathing apparatus for emergencies, neoprene or vinyl gloves, chemical safety goggles, face shield, neoprene safety shoes, neoprene suit or apron for splash protection

5.2 **Symptoms Following Exposure:** INHALATION symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and fatally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury. INGESTION symptoms similar to inhalation. SKIN: defatting action can cause dermatitis. EYES: exhibits irritating sensation and lachrymation.

5.3 **Treatment for Exposure:** Do NOT administer adrenalin or epinephrine; get medical attention in all cases of overexposure. INHALATION: remove victim to fresh air, if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting, repeat three times, then give 1 tablespoon epsom salt in water. EYES: flush thoroughly with water. SKIN: wash thoroughly with soap and warm water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** 200 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 3; 1 lb. 50 to 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. Toxic effects are temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 50 ppm

6. FIRE HAZARDS

6.1 **Flash Point.** 90°F C.C. practically nonflammable

6.2 **Flammable Limits in Air:** 8.0 - 10.5%

6.3 **Fire Extinguishing Agents:** Water fog

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are produced in fire situations.

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 770°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** 660 mg/l 40 hr daphnia/fresh water

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640

2. E. I. duPont de Nemours & Co., Inc.
Electrochemicals Dept.
Wilmington, Del. 19898

3. PPG Industries, Inc.
Industrial Chemical Division
Lake Charles, La. 70601

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical, dry cleaning, degreasing, extraction

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 131.39

13.3 **Boiling Point at 1 atm:** 189°F = 87°C = 360°K

13.4 **Freezing Point:** -123.0°F = -86.4°C = 186.7°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.46 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 29.3 dynes/cm = 0.0293 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 34.5 dynes/cm = 0.0345 N/m at 24°C

13.10 **Vapor (Gas) Specific Gravity:** 4.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.116

13.12 **Latent Heat of Vaporization:** 103 Btu/lb = 57.2 cal/g = 2.40 × 10⁵ J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5045

NOTES

REVISED 1978

TCF TRICHLOROFLUOROMETHANE

Common Synonyms
F-11
Freon 11
Genetron 11

Liquid | Colorless | Odorless

Sinks in water. Harmful vapor is produced. Boiling point is 75°F.

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

CALL FOR MEDICAL AID
VAPOR
If inhaled, will cause dizziness or difficult breathing.
LIQUID
Not harmful

Water Pollution

Not harmful to aquatic life.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Should be removed.
Chemical and physical treatment

2. LABELS

Not hazard labeled as required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Arcton 9 (Trade name), Carrene 1, Daiflon S-1, Eutron 1, Eutron II, Fluorocarbon 11, Fluorocarbon 11, Freon 11, Freon 11 F, Frigen 11, Genetron 11, Genetron 11 (Trade name), Halocarbon 11, Isotron 11, Isotron 11 F, Kaltron 11, Kaltron 11 F, Ledon 11, Ledon 11 F, Ledon 11 FA, Ledon 11 FB, Ledon 11 FC, Ledon 11 FD, Ledon 11 FE, Ledon 11 FF, Ledon 11 FG, Ledon 11 FH, Ledon 11 FI, Ledon 11 FJ, Ledon 11 FK, Ledon 11 FL, Ledon 11 FM, Ledon 11 FN, Ledon 11 FO, Ledon 11 FP, Ledon 11 FQ, Ledon 11 FR, Ledon 11 FS, Ledon 11 FT, Ledon 11 FU, Ledon 11 FV, Ledon 11 FW, Ledon 11 FX, Ledon 11 FY, Ledon 11 FZ, Ledon 11 GA, Ledon 11 GB, Ledon 11 GC, Ledon 11 GD, Ledon 11 GE, Ledon 11 GF, Ledon 11 GG, Ledon 11 GH, Ledon 11 GI, Ledon 11 GJ, Ledon 11 GK, Ledon 11 GL, Ledon 11 GM, Ledon 11 GN, Ledon 11 GO, Ledon 11 GP, Ledon 11 GQ, Ledon 11 GR, Ledon 11 GS, Ledon 11 GT, Ledon 11 GU, Ledon 11 GV, Ledon 11 GW, Ledon 11 GX, Ledon 11 GY, Ledon 11 GZ, Ledon 11 HA, Ledon 11 HB, Ledon 11 HC, 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Ledon 11 CN, Ledon 11 CO, Ledon 11 CP, Ledon 11 CQ, Ledon 11 CR, Ledon 11 CS, Ledon 11 CT, Ledon 11 CU, Ledon 11 CV, Ledon 11 CW, Ledon 11 CX, Ledon 11 CY, Ledon 11 CZ, Ledon 11 DA, Ledon 11 DB, Ledon 11 DC, Ledon 11 DD, Ledon 11 DE, Ledon 11 DF, Ledon 11 DG, Ledon 11 DH, Ledon 11 DI, Ledon 11 DJ, Ledon 11 DK, Ledon 11 DL, Ledon 11 DM, Ledon 11 DN, Ledon 11 DO, Ledon 11 DP, Ledon 11 DQ, Ledon 11 DR, Ledon 11 DS, Ledon 11 DT, Ledon 11 DU, Ledon 11 DV, Ledon 11 DW, Ledon 11 DX, Ledon 11 DY, Ledon 11 DZ, Ledon 11 EA, Ledon 11 EB, Ledon 11 EC, Ledon 11 ED, Ledon 11 EE, Ledon 11 EF, Ledon 11 EG, Ledon 11 EH, Ledon 11 EI, Ledon 11 EJ, Ledon 11 EK, Ledon 11 EL, Ledon 11 EM, Ledon 11 EN, Ledon 11 EO, Ledon 11 EP, Ledon 11 EQ, Ledon 11 ER, Ledon 11 ES, Ledon 11 ET, Ledon 11 EU, Ledon 11 EV, Ledon 11 EW, Ledon 11 EX, Ledon 11 EY, Ledon 11 EZ, Ledon 11 FA, Ledon 11 FB, Ledon 11 FC, Ledon 11 FD, Ledon 11 FE, Ledon 11 FF, Ledon 11 FG, Ledon 11 FH, Ledon 11 FI, Ledon 11 FJ, Ledon 11 FK, Ledon 11 FL, Ledon 11 FM, Ledon 11 FN, Ledon 11 FO, Ledon 11 FP, Ledon 11 FQ, Ledon 11 FR, Ledon 11 FS, Ledon 11 FT, Ledon 11 FU, Ledon 11 FV, Ledon 11 FW, Ledon 11 FX, Ledon 11 FY, Ledon 11 FZ, Ledon 11 GA, Ledon 11 GB, Ledon 11 GC, Ledon 11 GD, Ledon 11 GE, Ledon 11 GF, Ledon 11 GG, Ledon 11 GH, Ledon 11 GI, Ledon 11 GJ, Ledon 11 GK, Ledon 11 GL, Ledon 11 GM, Ledon 11 GN, Ledon 11 GO, Ledon 11 GP, Ledon 11 GQ, Ledon 11 GR, Ledon 11 GS, Ledon 11 GT, Ledon 11 GU, Ledon 11 GV, Ledon 11 GW, Ledon 11 GX, Ledon 11 GY, Ledon 11 GZ, Ledon 11 HA, Ledon 11 HB, Ledon 11 HC, Ledon 11 HD, Ledon 11 HE, Ledon 11 HF, Ledon 11 HG, Ledon 11 HH, Ledon 11 HI, Ledon 11 HJ, Ledon 11 HK, Ledon 11 HL, Ledon 11 HM, Ledon 11 HN, Ledon 11 HO, Ledon 11 HP, Ledon 11 HQ, Ledon 11 HR, Ledon 11 HS, Ledon 11 HT, Ledon 11 HU, Ledon 11 HV, Ledon 11 HW, Ledon 11 HX, Ledon 11 HY, Ledon 11 HZ, Ledon 11 IA, Ledon 11 IB, Ledon 11 IC, Ledon 11 ID, Ledon 11 IE, Ledon 11 IF, Ledon 11 IG, Ledon 11 IH, Ledon 11 II, Ledon 11 IJ, Ledon 11 IK, Ledon 11 IL, Ledon 11 IM, Ledon 11 IN, Ledon 11 IO, Ledon 11 IP, Ledon 11 IQ, Ledon 11 IR, Ledon 11 IS, Ledon 11 IT, Ledon 11 IU, Ledon 11 IV, Ledon 11 IW, Ledon 11 IX, Ledon 11 IY, Ledon 11 IZ, Ledon 11 JA, Ledon 11 JB, Ledon 11 JC, Ledon 11 JD, Ledon 11 JE, Ledon 11 JF, Ledon 11 JG, Ledon 11 JH, Ledon 11 JI, Ledon 11 JJ, Ledon 11 JK, Ledon 11 JL, Ledon 11 JM, Ledon 11 JN, Ledon 11 JO, Ledon 11 JP, Ledon 11 JQ, Ledon 11 JR, Ledon 11 JS, Ledon 11 JT, Ledon 11 JU, Ledon 11 JV, Ledon 11 JW, Ledon 11 JX, Ledon 11 JY, Ledon 11 JZ, Ledon 11 KA, Ledon 11 KB, Ledon 11 KC, Ledon 11 KD, Ledon 11 KE, Ledon 11 KF, Ledon 11 KG, Ledon 11 KH, Ledon 11 KI, Ledon 11 KJ, Ledon 11 KK, Ledon 11 KL, Ledon 11 KM, Ledon 11 KN, Ledon 11 KO, Ledon 11 KP, Ledon 11 KQ, Ledon 11 KR, Ledon 11 KS, Ledon 11 KT, Ledon 11 KU, Ledon 11 KV, Ledon 11 KW, Ledon 11 KX, Ledon 11 KY, Ledon 11 KZ, Ledon 11 LA, Ledon 11 LB, Ledon 11 LC, Ledon 11 LD, Ledon 11 LE, Ledon 11 LF, Ledon 11 LG, Ledon 11 LH, Ledon 11 LI, Ledon 11 LJ, Ledon 11 LK, Ledon 11 LL, Ledon 11 LM, Ledon 11 LN, Ledon 11 LO, Ledon 11 LP, Ledon 11 LQ,

TPH	TRICHLOROPHENOL

Common Synonyms
2,4,5-Trichlorophenol
Dowicide 2
Preventol

Solid crystals or flakes — Yellow — Strong disinfectant odor

Sinks in water

Fire

Not flammable

Exposure

DUST OR SOLID
Irritating to eyes, nose, and throat

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Evaporation
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dowicide 2
Ortho
Preventol
2,4,5-Trichlorophenol

3.2 **Coast Guard Compatibility Classification:**
Not applicable

3.3 **Chemical Formula:** $HOC_6H(Cl)_3$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Colorless to gray

4.3 **Odor:** Strong disinfectant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved dust respirator, chemical safety goggles, protective clothing to prevent contact with skin

5.2 **Symptoms Following Exposure:** Dust may cause swelling of eyes and eyelids, mucous membrane irritation of nose and throat. Solid irritates skin and prolonged contact

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, get medical attention. EYES: flush with water for at least 15 minutes, get medical attention. SKIN: wash with soap and water, remove contaminated clothing, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Moderately toxic to humans. Oral dose 2 LD50 = 820 mg/kg (rats)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Exposure to vapor outside of eyes at room temperature is

5.9 **Liquid or Solid Irritant Characteristics:** May cause irritation of eyes. Prolonged contact with skin may cause slight burn. Dust irritates nose and throat

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:** None

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
1.2 ppm 24 hr TLm Humpback salmon fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):**
Data not available

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1. Dow Chemical
Midland, Michigan
2. Hooker Chemical Corp
Niagara Falls, N.Y. 14302

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 95%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**
Solid form not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 197.5

13.3 **Boiling Point at 1 atm:**
365°F = 252°C = 525°K

13.4 **Freezing Point:** 154°F = 68°C = 330°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.7 at 24°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization:**
Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

TCA	2,4,5-TRICHLOROPHENOXYACETIC ACID

Common Synonyms

2,4,5-T

Solid White Odorless

Sinks in water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: person, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,4,5-T

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $2,4,5\text{-}Cl_3C_6H_2OCH_2COOH$

3.4 **IMCO/United Nations Numerical Designation:** 6.1 1609

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask and rubber gloves

5.2 **Symptoms Following Exposure:** Overexposure to dust by inhalation or ingestion may cause fatigue, nausea, vomiting, lowered blood pressure, convulsions, coma. Dust may irritate eyes and skin

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, if required, give artificial respiration. EYES: flush with water until irritating dust is removed. SKIN: wash with soap and water. INGESTION: call physician at once; induce vomiting and administer gastric lavage

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 500 mg/kg (rat)

5.7 **Late Toxicity:** Both defects in rats and mice. Causes an acne-like skin eruption among human workers

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water fog, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases may be formed

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Can be corrosive to common metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
1.0 ppm 24 hr Bluegill 12 cm fresh water
0.32 ppm/48 hr spot 30 cm salt water

8.2 **Waterfowl Toxicity:** 21 days, ppm LD_{50}

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Will not bioconcentrate

9. SELECTED MANUFACTURERS

1. Dow Chemical Co
Midland, Mich. 48640

2. Transvaal Inc
P.O. Box 69
Jacksonville, Ark. 72076

3. Monsanto Co
800 N. Lindbergh Boulevard
St. Louis, Mo. 63166

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisons, Class B

12.2 **MAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 255.5

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:**
$316°F = 158°C = 431°K$

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.801 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** (est.) = 6,500 Btu/lb = = 3,600 cal/g = = 150 x 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

TCS

TRICHLOROSILANE

Common Synonyms
Trichlorosilane
Silicochloroform

Liquid | Colorless | Sharp choking odor

Reacts violently with water. Irritating gas is produced on contact with water. Boiling point is 90° F.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, corrosive, air contaminant.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Silicochloroform, Trichlorosilicomonane
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $SiHCl_3$
3.4 **NIOC/United Nations Numerical Designation:** 1295

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sharp, choking, like hydrochloric acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirator, protective rubber gloves, chemical worker's goggles, other protective equipment as necessary to protect skin and eyes.
5.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of respiratory system. Liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.
5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure. If breathing is difficult or stopped, give artificial respiration, call physician. EYES or SKIN: Flush with plenty of water immediately for at least 15 min. and get medical attention. INGESTION: do NOT induce vomiting, give large amount of water, get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 1,000 mg/kg (rats)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and severe injury to the eyes.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** -18°F (O.C.) = -28°F (C.C.)
6.2 **Flammable Limits in Air:** 1.2% - 90.5%
6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and chlorine gases may form in fires.
6.6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 120°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride fumes (hydrochloric acid).
7.2 **Reactivity with Common Materials:** Reacts with surface moisture to form hydrochloric acid, which corrodes common metals and forms flammable hydrogen gas.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Stauffer Chemical Company
Chemicals Division
8 Cypress Street
Revere, Mass. 01951

2 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

3 Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

4.4.0

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	4
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	3

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 135.5
13.3 **Boiling Point at 1 atm:**
90°F = 32°C = 305°K
13.4 **Freezing Point:**
-197°F = -127°C = 146°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.344 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.)
19.1 dynes/cm = 0.0191 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4.6
13.11 **Ratio of Specific Heats of Vapor (Gas):**
Data not available
13.12 **Latent Heat of Vaporization:** 115 Btu/lb
= 47 cal/g = 2.0 × 10⁵ J/kg
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

TCT	TRICHLORO-s-TRIAZINETRIONE

Common Synonyms

Trichlorocyanuric acid
(DICHLOR)
Trichloroisocyanuric acid
Trichloro-s-triazinetrione
Trichloromelamine
Trichloroisocyanuric acid
Trichlorotriazinetrione

Solid — White — Bleach-like odor

Sinks and mixes slowly with water

Fire

Not flammable
May cause fire on contact with combustibles
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire

Exposure

INHALED
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Isolate warning endangering material
water contaminant
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichlorocyanuric acid, Trichloroisocyanuric acid, Trichlorotriazinetrione, Trichloromelamine, 1,3,5-Trichloro-2,4,6-triazinetrione, 1,3,5-Trichloro-2,4,6-triazinetrione

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_3N_3Cl_3O_3$

3.4 **IMCO/United Nations Numerical Designations:** 9.1

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Like chlorine

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask or chlorine canister mask, goggles, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes sneezing and coughing. Contact with dust causes moderate irritation of eyes and itching and redness of skin. Ingestion causes burns of mouth and stomach

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. EYES: irrigate with running water for 15 min., call physician. SKIN: flush with water. INGESTION: induce vomiting and call physician

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 750 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but may cause fire on contact with ordinary combustibles

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water in large amounts

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic chlorine or hydrogen chloride may be formed in fires

6.6 **Behavior in Fire:** Containers may explode when heated

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to form bleach solution. The reaction is not hazardous

7.2 **Reactivity with Common Materials:** Contact with most foreign material organic matter or easily chlorinated or oxidized materials may result in fire. Wood, oil, grease, sawdust, flour, sugar, other easily oxidized organic compounds

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. FMC Corporation
Industrial Chemical Division
633 Third Avenue
New York, N.Y. 10017

2. Monsanto Co.
800 N. Lindbergh Boulevard
St. Louis, Mo. 63166

3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 39 - 40% available chlorine

10.2 **Storage Temperature:** Ambient
Avoid elevated temperatures

10.3 **Inert Atmosphere:** No requirement of this

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II-SN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	2
	OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 232.5

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** (est.) >1 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5-643)

NOTES

TCP — TRICRESYL PHOSPHATE

Common Synonyms
TCP
Tri-p-cresyl phosphate

Liquid | Colorless | Odorless

Sinks in water

Soluble in
Colorless
Insoluble in
Soluble in

Fire

Combustible

Extinguish with dry chemical, CO2, water spray or foam
Water may be ineffective
Cool exposed containers with water

Exposure

LIQUID
Harmful if swallowed

If WATER is added to ASH, foam will form

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify authorities if wildlife affected
Notify authorities if liquid enters sewers or waterways

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** TCP
Tri-p-tolyl phosphate
Tri-p-cresyl phosphate

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $(p\text{-}CH_3C_6H_4O)_3PO$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles or face shield

5.2 **Symptoms Following Exposure.** Vapors may irritate eyes but only at high temperatures Ingestion of liquid may cause severe damage to central nervous system and death if significant amounts of the toxic ortho isomer are present

5.3 **Treatment for Exposure** INGESTION induce vomiting and call a doctor EYES flush with water for at least 15 min SKIN wipe off wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5.5 **Short-Term Inhalation Limits** Not pertinent

5.6 **Toxicity by Ingestion** Grade 2 LD_{50} 0.5 to 5 g/kg (chicken LD_{50} > 2 g/kg)

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary The compound is non volatile for all practical purposes

5.9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard Practically harmless to the skin

5.10 **Odor Threshold** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point** 410°F C C

6.2 **Flammable Limits in Air** Data not available

6.3 **Fire Extinguishing Agents** Foam dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate.** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 FMC Corp
Organic Chemicals Division
633 Third Ave
New York N Y 10017

2 Monsanto Co
Monsanto Industrial Chemicals Co
800 N Lindbergh Blvd
St Louis Mo 63166

3 Stauffer Chemical Co
Specialty Chemicals Division
Gallipolis Ferry W Va 25515

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Consists primarily of the para isomer but several commercial grades may contain a significant proportion of tri ortho cresyl phosphate Latter is considerably more toxic than the para isomer if ingested

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight** 368

13.3 **Boiling Point at 1 atm.** 770°F = 410°C = 683°K

13.4 **Freezing Point** −27°F = −33°C = 240°K

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity** 1.16 at 20°C (liquid)

13.8 **Liquid Surface Tension** 44 dynes/cm = 0.044 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension.** Data not available

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** est 150.0 Btu/lb = 44.5 cal/g = 1.86 × 10⁵ J/kg

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

TRIDECANOL

Common Synonyms
1-Tridecanol
Oxotridecyl alcohol

Oily liquid | Colorless | Mild, pleasant odor

Floats on water

Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1-tridecanol
Isotridecyl alcohol
1-Tridecanol

3 2 **Coast Guard Compatibility Classification.** Alcohol

3 3 **Chemical Formula.** $C_{12}H_{25}CH_2OH$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild alcoholic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Synthetic rubber gloves, chemical goggles

5 2 **Symptoms Following Exposure** Inhalation hazard slight. Skin contact results in moderate irritation. Liquid contact with eyes causes severe irritation and possible eye damage

5 3 **Treatment for Exposure:** EYES promptly flush with clean water for at least 15 min and see a physician. SKIN wash exposed area with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 280°F O C

6 2 **Flammable Limits in Air.** Data not available

6 3 **Fire Extinguishing Agents** Alcohol foam, dry chemical, water fog

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston, Tex 77001

2 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Mixed isomers 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 200 37

13 3 **Boiling Point at 1 atm.** 525°F = 274°C = 547°K

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 0 846 at 20°C (liquid)

13 8 **Liquid Surface Tension:** (est) 30 dynes/cm = 0 03 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est) 30 dynes/cm = 0 03 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 027

13 12 **Latent Heat of Vaporization:** 120 Btu/lb = 64 cal/g = 2 7 × 10⁵ J/kg

13 13 **Heat of Combustion:** (est) = 12 200 Btu/lb = −6 700 cal/g = −28 4 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(continued on pages 5 and 6)

NOTES

TDC	# 1-TRIDECENE

Common Synonyms			
Undecylethylene	Watery liquid	Colorless	Mild pleasant odor
	Floats on water		

Fire	**Combustible**
Exposure	**LIQUID** **Irritating to eyes.**
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **Fouling to shoreline** **May be dangerous if it enters water intakes**

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Undecylethylene
3 2 **Coast Guard Compatibility Classification** Olefin
3 3 **Chemical Formula.** $CH_2CH(CH_2)_8CH_2CH_3$
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color.** Colorless
4 3 **Odor.** Mild pleasant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield
5 2 **Symptoms Following Exposure.** Liquid may irritate eyes
5 3 **Treatment for Exposure.** EYES flush with water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity.** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Non-volatile
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** 175°F (approx.)
6 2 **Flammable Limits in Air.** Data not available
6 3 **Fire Extinguishing Agents.** Dry chemical foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire.** Not pertinent.
6 7 **Ignition Temperature.** Data not available
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate.** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston, Tex. 77001
2 The Humphrey Chemical Co
Devine Street
North Haven, Conn. 06473
3 Phillips Petroleum Co
Bartlesville, Okla. 74004

10 SHIPPING INFORMATION

10 1 **Grades of Purity.** Technical 95%
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-1-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 182.35
13 3 **Boiling Point at 1 atm:** 451°F = 233°C = 506°K
13 4 **Freezing Point:** −11°F = −24°C = 249°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 0.765 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 24.5 dyn s/cm = 0.0245 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.029
13 12 **Latent Heat of Vaporization.** 110 Btu/lb = 59 cal/g = 2.5×10^5 J/kg
13 13 **Heat of Combustion.** −19 048 Btu/lb = −10 582 cal/g = -443.03×10^5 J/g
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continues on pages 5 and 61

NOTES

TEA — TRIETHANOLAMINE

Common Synonyms
Triethylolamine
Trihydroxytriethylamine
Tris hydroxyethylamine

Oily liquid | Colorless | Mild ammonia odor

Sinks and mixes with water. Freezing point is 71° F.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 2,2',2''-Nitrilotriethanol
Triethylolamine
Trihydroxytriethylamine
Tris(hydroxyethyl)amine

3 2 **Coast Guard Compatibility Classification.** Alkanolamine

3 3 **Chemical Formula:** $(HOCH_2CH_2)_3N$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild ammoniacal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves and boots

5 2 **Symptoms Following Exposure:** Liquid may irritate eyes and skin

5 3 **Treatment for Exposure.** EYES: flush with water for at least 15 min., call a doctor. SKIN: wipe off, wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion.** Grade 2; LD50 = 10 g/kg (guinea pig)

5 7 **Late Toxicity.** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not available

5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold.** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point.** 355°F C.C. (179°C O.C.)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Alcohol foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate.** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Dilute with water

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** >100 ppm/48 hr/shrimp/TLm/salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 1.5 g/g/5 days, 0.8 g/g/20 days

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640

2. Jefferson Chemical Co., Inc.
3336 Richmond Ave.
Houston, Tex. 77082

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 85, 99%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

XPQ

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicants	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	1

*First column refers to non-fire situations

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C. and 1 atm:** Liquid

13 2 **Molecular Weight:** 149.19

13 3 **Boiling Point at 1 atm.** Decomposes

13 4 **Freezing Point.** 70.9°F = 21.6°C = 294.8°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.13 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** 1.036

13 12 **Latent Heat of Vaporization.** 176 Btu/lb = 97 Kcal/g = 4.10 × 10⁵ J/kg

13 13 **Heat of Combustion:** -11,050 Btu/lb = -6140 cal/g = -257 × 10⁵ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** (est.) 20 Btu/lb = -12 cal/g = -.5 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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TAL — TRIETHYLALUMINUM

Common Synonyms

TEA
Aluminum triethyl
ATE

Liquid Colorless

IGNITES WHEN EXPOSED TO AIR Flammable gas is produced on contact with water

Fire

IGNITES WHEN EXPOSED TO AIR

POISONOUS GASES MAY BE PRODUCED IN FIRE

DO NOT USE WATER

Exposure

LIQUID

Will burn skin and eyes
Harmful if swallowed

DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning high flammability
Restrict access
Evacuate area
Disperse and flush with care

2 LABELS



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** ATE Aluminum triethyl TEA

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula.** $(C_2H_5)_3Al$

3 4 **IMCO/United Nations Numerical Designation** 9 2 1102

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor** Not pertinent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Full protective clothing preferably of aluminized glass cloth goggles face shield gloves In case of fire all purpose canister or self contained breathing apparatus

5 2 **Symptoms Following Exposure:** Exposure to smoke from fire causes metal fume fever (flu like symptoms) Since liquid ignites spontaneously contact with eyes or skin causes severe burns

5 3 **Treatment for Exposure:** INHALATION only fume from fire need be considered metal fume fever is not critical Lasting less than 36 hrs EYES flush gently with copious quantities of water for 15 min with lids held open Treat burns if fire occurred get medical attention SKIN wash with water, treat burns caused by fire get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value,** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion** Not pertinent Ignites instantly in air reacts vigorously with water

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third degree burns on short contact and is very injurious to the eyes

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point** Ignites spontaneously in air at all temperatures

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents** Inert powders (sand, limestone) dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Water foam halogenated extinguishing agents

6 5 **Special Hazards of Combustion Products** Irritative smoke may cause metal fume fever

6 6 **Behavior in Fire:** Dense smoke of aluminum oxide forms Contact with water applied to adjacent fires causes violent reaction producing toxic and flammable gases

6 7 **Ignition Temperature** Not pertinent (self ignites at ambient temperature)

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently to form flammable ethane gas

7 2 **Reactivity with Common Materials:** No significant reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent.

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Not pertinent

8 2 **Waterfowl Toxicity** Not pertinent

8 3 **Biological Oxygen Demand (BOD)** Not pertinent

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Ethyl Corporation
Industrial Chemicals Division
Ethyl Tower 451 Florida
Baton Rouge La 70801

2 Texas Alkyls Incorporated
P O Box 600
Deer Park Texas 77536

3 Ventron Corporation
Alfa Products
P O Box 159
Beverly Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 93+% 20% or less by weight in benzene hexane or heptane Solutions are non pyrophoric

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** Inerted dry nitrogen at 5 psig

*10 4 **Venting** Safety relief with rupture disc

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-O-/

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Irritant	
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification*
Health Hazard (Blue)	3
Flammability (Red)	
Reactivity (Yellow)	3
	W

*Up to 20% by wt in hydrocarbon solution

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 114 2

13 3 **Boiling Point at 1 atm:**
365 8°F = 185 9°C = 459 8°K

13 4 **Freezing Point:**
-51°F = -46°C = 227 2°K

13 5 **Critical Temperature**
761°F = 405°C = 678°K

13 6 **Critical Pressure:**
1,970 psia = 134 atm = 13 6 MN/m²

13 7 **Specific Gravity:** 0 836 at 20°C (liquid)

13 8 **Liquid Surface Tension.**
26 1 dynes/cm = 0 0261 N/m at 28°C

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Data not available

13 12 **Latent Heat of Vaporization.** 216 Btu lb
= 120 cal/g = 5 02 × 10⁵ J/kg

13 13 **Heat of Combustion:** -18 364 Btu lb
= -10 202 cal/g = -426 88 × 10⁵ J kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** -1,995 Btu lb
= -1 109 cal/g = -46 40 × 10⁵ J kg

*13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

TEN — TRIETHYLAMINE

Common Synonyms
TEN

Watery liquid | Colorless | Fishy odor

Floats on water. Flammable, irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause coughing, difficult breathing, or loss of consciousness.

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Foam to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** TEN
3.2 **Coast Guard Compatibility Classification:** Aliphatic amine
3.3 **Chemical Formula:** $(C_2H_5)_3N$
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1296

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Fishy

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask, goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Vapor irritates nose, throat and lungs causing coughing, choking and difficult breathing. Contact with eyes causes severe burns. Clothing wet with chemical causes skin burns.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give artificial respiration if needed, call a doctor. INGESTION: induce vomiting if patient is conscious. EYES: flush with water for at least 30 min., call a doctor. SKIN: flush with water for at least 30 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm
5.5 **Short-Term Inhalation Limits:** 100 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 3; LD_{50} 50 to 500 mg/kg (rat); LD_{50} 460 mg/kg)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause severe burns on prolonged exposure.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 20°F (C.C.)
6.2 **Flammable Limits in Air:** 1.2% - 8.0%
6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, alcohol foam for large fires
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 542°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 0.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 80 ppm/24 hr/Fish/Lethal/Fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals Inc
Allentown PA 18105
2. Pennwalt Corp
Chemical Division
4658 Biddle Ave
Wyandotte Mich 48193
3. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 98.5%+
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

APQRS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 101.19
13.3 **Boiling Point at 1 atm:** 193.1°F = 89.5°C = 362.7°K
13.4 **Freezing Point:** −174.9°F = −114.7°C = 158.5°K
13.5 **Critical Temperature:** 504°F = 262°C = 535°K
13.6 **Critical Pressure:** 440 psia = 30 atm = 3.0 MN/m²
13.7 **Specific Gravity:** 0.729 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 20.7 dynes/cm = 0.0207 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.055
13.12 **Latent Heat of Vaporization:** 140 Btu/lb = 80 cal/g = 3.3 × 10⁵ J/kg
13.13 **Heat of Combustion:** −17 930 Btu/lb = −9 965 cal/g = −396.3 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** −190 Btu/lb = −99 cal/g = −4.1 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

TEB — TRIETHYLBENZENE

Common Synonyms: 1,3,5-Triethylbenzene; sym-Triethylbenzene

Liquid | Colorless | Weak chemical odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4:

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1,3,5-Triethylbenzene; sym-Triethylbenzene
3 2 **Coast Guard Compatibility Classification.** Aromatic hydrocarbon
3 3 **Chemical Formula:** $C_{12}H_{18}$; $C_6H_3(C_2H_5)_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Weak aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield; rubber gloves
5 2 **Symptoms Following Exposure:** Eye irritation by vapors or liquid. Central nervous system depression. Prolonged skin contact with liquid may cause dermatitis
5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min; call a doctor. SKIN: wipe off; wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 181°F (C.C.)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

No bulk shipments

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3):

NFI

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemicals	1
Water	
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 162.27
13 3 **Boiling Point at 1 atm:** 421°F = 216°C = 489 K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.861 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension.** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.039
13 12 **Latent Heat of Vaporization:** (est.) 120 Btu/lb = 65 cal/g = 2.7 × 10⁵ J/kg
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

TEG — TRIETHYLENE GLYCOL

Common Synonyms
Triglycol

Liquid | Colorless | Mild odor

Sinks and mixes with water

Fire

Combustible

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Di-beta-hydroxyethoxyethane 2,2' Ethylenedioxydiethanol Ethylene glycol di-beta-hydroxyethyl ether HOT Triglycol

3 2 **Coast Guard Compatibility Classification:** Group I

3 3 **Chemical Formula:** HOCH$_2$CH$_2$OCH$_2$CH$_2$OCH$_2$CH$_2$OH

3 4 **IMCO United Nations Numerical Designation.** Not Listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Very mild sweet

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gauntlet plastic gloves

5 2 **Symptoms Following Exposure:** Vapor and liquid are unlikely to cause harm

5 3 **Treatment for Exposure:** Flush eyes and skin with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ 15 g/kg guinea pig

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are non-irritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 350°F (C.O.C.) 330°F (O.C.)

6 2 **Flammable Limits in Air:** 0.9% - 9.2%

6 3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 700°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 1.7 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 50% 5 days

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich. 48640

2 Jefferson Chemical Co
3330 Richmond Ave
Houston, Tex. 77002

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** High purity, all treatment, commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NPQ

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poison	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 150.17

13 3 **Boiling Point at 1 atm.**
550°F = 288°C = 561°K

13 4 **Freezing Point:**
23.7°F = -4.3°C = 269 °K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.128 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
48.2 dynes/cm = 0.0482 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.039

13 12 **Latent Heat of Vaporization.**
180 Btu/lb = 99 cal/g = 4.1 × 10^5 J/kg

13 13 **Heat of Combustion:** ~10,190 Btu/lb
= ~5660 cal/g = ~237.0 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (est.) ~13 Btu/lb
= ~7 cal/g = ~ 3 × 10^4 J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

TET — TRIETHYLENETETRAMINE

Common Synonyms
TETA
N,N' Bis(2-aminoethyl) ethylenediamine

Oily liquid | Light straw to amber | Ammonia odor

Floats and mixes with water

Fire

Combustible

Exposure

CAUTION!

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** N,N' Bis(2-aminoethyl)-ethylenediamine
TETA
Trien

3 2 **Coast Guard Compatibility Classification.** Aliphatic amine

3 3 **Chemical Formula:** $NH_2CH_2CH_2NHCH_2CH_2NHCH_2CH_2NH_2$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color** Light straw to amber

4 3 **Odor** Ammoniacal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Amine type canister, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Vapors from hot liquid can irritate eyes and upper respiratory system. Liquid burns eyes and skin. May cause sensitization of skin.

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting; give large quantities of water; give at least one ounce of vinegar in equal amount of water; get medical attention. SKIN: flush with plenty of water. EYES: flush with plenty of water for at least 15 min. and get medical attention.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 2 LD$_{50}$ 2.0 to 5.0 g/kg (rat)

5 7 **Late Toxicity:** May cause dermatitis, asthma and other allergic reactions in man

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate ocular discomfort at concentrations that permit adequate breathing. Irritation concentrations not pleasant. Effects temporary.

5 9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure; may cause second and third degree burns on prolonged exposure.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 275°F (C.C.) 290°F (O.C.)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 640°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** After dilution with water can be neutralized with acetic acid

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co.
Midland, Mich. 48640

2 Jefferson Chemical Co., Inc.
4501 Richmond Ave.
Houston, Tex. 77027

3 Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99+ %

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 146.24

13 3 **Boiling Point at 1 atm:** 532.3°F = 277.4°C = 550.6°K

13 4 **Freezing Point:** −31°F = −35°C = 238°K

13 5 **Critical Temperature:** 900°F = 460°C = 733°K

13 6 **Critical Pressure:** 470 psia = 32 atm = 3.2 MN/m²

13 7 **Specific Gravity:** 0.982 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.03*

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) −13,900 Btu/lb = −7,730 cal/g = −315 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** (est.) −1 Btu/lb = −7 cal/g = −0.3 × 10³ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

TFC — TRIFLUOROCHLOROETHYLENE

Common Synonyms Chlorotrifluoroethylene Trifluorovinyl chloride CTFE Genetron 1113 Trifluoromonochloroethylene Kel F monomer Plaskon monomer	Liquefied compressed gas Colorless Odorless or faint odor Sinks and boils in water Flammable visible vapor cloud is produced
Fire	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR If inhaled will cause dizziness nausea or vomiting LIQUID Will cause frostbite
Water Pollution	Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability, air contaminant
Restrict access
Evacuate area

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Chlorotrifluoroethylene, Kel F monomer, Plaskon monomer, Trifluoromonochloroethylene, Trifluorovinyl chloride

3 2 **Coast Guard Compatibility Classification:** Halogenated compounds (5)

3 3 **Chemical Formula:** $F_2C=CFCl$

3 4 **IMCO/United Nations Numerical Designation.** 2 1082

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Compressed liquefied gas

4 2 **Color:** Colorless

4 3 **Odor:** None faint ethereal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus goggles rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes dizziness nausea vomiting liver and kidney injury may develop after several hours and cause jaundice and necrosis of the kidney Contact with liquid causes frostbite of eyes and possibly of skin

5 3 **Treatment for Exposure:** *Call a physician after all exposures to this compound it is more toxic than most of the closely related propellant gases* INHALATION remove victim to fresh air enforce bed rest, administer oxygen for 30 min of every hour for 6 hours even if no symptoms appear SKIN if frostbite has occurred apply warm water and treat burn

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 20 ppm (suggested)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Not pertinent (TFC is a gas at normal temperatures)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent (gas)

6 2 **Flammable Limits in Air:** 16% 34

6 3 **Fire Extinguishing Agents:** Let fire burn stop gas flow cool containers with water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic hydrogen chloride and hydrogen fluoride gases are formed

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back Containers may explode in a fire

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Can occur

7 6 **Inhibitor of Polymerization.** Terpenes, Tributylamine (1%)

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 FMC Company
FMC Center
Saint Paul Minn 55101

2 Matheson Gas Products Co
East Rutherford, N J 07073

3 Allied Chemical Corporation
Plastics Division
Morristown N J 07960

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Polymerization grade 99 0+%

10 2 **Storage Temperature.** Ambient (no less than 150°F)

10 3 **Inert Atmosphere:** Air must be excluded

10 4 **Venting.** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C H I J

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight.** 116 5

13 3 **Boiling Point at 1 atm:** −18°F = −28°C = 245°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** (est.) 223 2°F = 106 2°C = 379 4°K

13 6 **Critical Pressure:** (est.) 592 psia = 40 2 atm = 4 08 MN/m

13 7 **Specific Gravity:** 1 50 at 20°C (liquid)

13 8 **Liquid Surface Tension:** (est.) 12 dynes/cm = 0 012 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4 02

13 11 **Ratio of Specific Heats of Vapor (Gas)** Data not available

13 12 **Latent Heat of Vaporization:** 83 Btu/lb = 46 cal/g = 1 92 × 10⁵ J/kg

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Data not available

(Continued on page 5 of 6)

NOTES

TFR	# TRIFLURALIN

Common Synonyms

alpha, alpha, alpha-trifluoro-2, 6-dinitro-N, N-dipropyl-p-toluidine
Treflan

Solid — Yellow-orange

Sinks in water

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

DUST
POISONOUS IF INHALED

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Hazardous Materials Handbook, CG-446-4)

Issue warning, poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,6-Dinitro-N,N-dipropyl-4-trifluoromethylaniline; 2,6-Dinitro-N,N-dipropyl-alpha,alpha,alpha-trifluoro-p-toluidine; N,N-Dipropyl-2,6-dinitro-4-trifluoro methylaniline; Treflan; alpha, alpha, alpha-Trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine

3.2 **Coast Guard Compatibility Classification:** Not applicable

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Yellow-orange
4.3 **Odor:** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles, dust mask
5.2 **Symptoms Following Exposure:** Dust may irritate eyes. No toxic symptoms have been observed during the manufacture and use of this compound
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: wash with running water until physician's examination permits. SKIN: wash with soap and running water. INGESTION: induce vomiting, call physician
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 500 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** >165°F (O.C.)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen fluoride gas may be formed in fire.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.1 mg/l 48-hr TL$_m$ rainbow trout/distilled water
0.35 ppm 48-hr TL$_m$ bluegill/Lake Michigan fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

Elanco Products Company
P.O. Box 1750
Indianapolis, Ind. 46206

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 95%
Emulsifiable concentrate in flammable solvents
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not Listed
12.2 **MAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 335.3
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 104.9°F = 42.7°C = 315.9 K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.294 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** (est.) 9,040 Btu/lb = −5,020 cal/g = −210 × 10^3 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

3. CHEMICAL DESIGNATIONS (Cont'd)

3.3 **Chemical Formula:** $C_{13}H_{16}F_3N_3O_4$
3.4 **IMCO/United Nations Numerical Designation:** 6.1 1GN

TIA — TRIISOBUTYLALUMINUM

Common Synonyms

TIBA
TIBAL
Aluminum tri(isobutyl)

Liquid — Colorless

IGNITES WHEN EXPOSED TO AIR. Flammable gas is produced on contact with water.

Fire

IGNITES WHEN EXPOSED TO AIR

POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

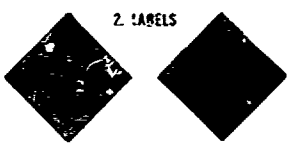
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability
Restrict access
Evacuate area
Disperse and flush with care

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Aluminum triisobutyl
TIBA, TIBAL

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $(i\text{-}C_4H_9)_3Al$

3.4 **IMCO/United Nations Numerical Designation:** 4.2, 1930

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Not pertinent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protective clothing, preferably of aluminized glass cloth; goggles; face shield; gloves. In case of fire, all purpose canister or self-contained breathing apparatus.

5.2 **Symptoms Following Exposure:** Inhalation of vapors from fire causes metal fume fever (flu-like symptoms). Contact with liquid can cause severe burns of eyes and skin because of spontaneous ignition.

5.3 **Treatment for Exposure:** INHALATION: only fumes from fire need be considered. Metal fume fever lasts less than 36 hrs. and is not critical. EYES: flush gently with copious quantities of water for 15 min. with lids open; treat burns. If fire occurred, get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention. INGESTION: not pertinent.

5.4 **Toxicity by Inhalation, (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** Metal fume fever may develop following exposure to smoke from fire.

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes.

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
(Ignites spontaneously)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Inert powder (e.g. sand, limestone) dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam, halogenated extinguishing agents

6.5 **Special Hazards of Combustion Products:** Dense smoke may cause metal fume fever

6.6 **Behavior in Fire:** Dense white aluminum oxide forms

6.7 **Ignition Temperature:** Ignites spontaneously under ambient conditions

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form flammable hydrocarbon gases

7.2 **Reactivity with Common Materials:** Not compatible with silicone rubber & urethane rubber

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Not pertinent

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Ethyl Corporation
Industrial Chemicals Division
Ethyl Tower 451 Florida
Baton Rouge, La. 70801

2. Texas Alkyls, Incorporated
P.O. Box 840
Deer Park, Texas 77536

3. Virginia Chemicals
Alta Products
P.O. Box 139
Beaver, West Virginia 25813

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 95% 20% or less by weight in aromatic hexane or heptane mixtures are not pyrophoric; electronic grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Inerted dry nitrogen at 5 psig

*10.4 **Venting:** Safety relief with rupture disc

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X O Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	4
Flammability (Red)	4
Reactivity (Yellow)	4
	W

*Refers to 20% or less by weight in hydrocarbon solution

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 198.3

*13.3 **Boiling Point at 1 atm:**
414°F = 212°C = 485°K

*13.4 **Freezing Point:**
5.36°F = 1.0°C = 274.2°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.788 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.)
24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

*13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization:** 107 Btu/lb = 59.4 cal/g = 2.5 × 10⁵ J/kg

13.13 **Heat of Combustion:** −19,424 Btu/lb = −10,235 cal/g = −4.28 × 10⁷ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

*13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

TMA	TRIMETHYLAMINE

Liquefied compressed gas. Colorless. Fish or ammonia odor.

Heats and ignites spontaneously on contact with water. Poisonous. Flammable vapor cloud is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4:

1.1 Initial Isolation and Warning: Keep unnecessary people away, isolate hazard area and deny entry.
Reference:
Evacuation Area:

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms.
3.2 **Coast Guard Compatibility Classification:** Aliphatic amine
3.3 **Chemical Formula:** $(CH_3)_3N$
3.4 **IMCO United Nations Numerical Designation:** 2083

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas
4.2 **Color:** Colorless
4.3 **Odor:** Ammonia

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Vapor protective clothing and self-contained breathing apparatus.
5.2 **Symptoms Following Exposure:** Vapor irritating to eyes, nose and throat. Liquid irritating to eyes and skin.
5.3 **Treatment for Exposure.** INHALATION: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, trained personnel may administer oxygen. SKIN: Flush with water. EYES: Flush with plenty of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available.
5.5 **Short-Term Inhalation Limits.** Data not available.
5.6 **Toxicity by Ingestion:** Data not available.
5.7 **Late Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is irritating to eyes, nose and throat. Irritation is mild at concentrations of 100 ppm and moderate at 1000 ppm.
5.9 **Liquid or Solid Irritant Characteristics:** Liquid irritating to eyes and skin. Prolonged or repeated skin exposure may cause severe dermatitis.
5.10 **Odor Threshold:** 0.1 ppm (by volume)

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (gas)
6.2 **Flammable Limits in Air:** 2.0% - 11.6%
6.3 **Fire Extinguishing Agents:** Stop flow of gas. Use water (carbon dioxide or dry chemical if gas ignited). Use water spray to cool containers.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
6.5 **Special Hazards of Combustion Products:** Not pertinent.
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to source of ignition and flash back.
6.7 **Ignition Temperature:** 478°C
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** Not available.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.
7.2 **Reactivity with Common Materials:** No reaction.
7.3 **Stability During Transport:** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Although water solutions may be neutralized with acids and, after evaporation, will remove all of the compound.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD):** Data not available.
8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc.
Allentown, Pa. 18105
2. Commercial Solvents Corp.
245 Park Ave.
New York, N.Y. 10017
3. Rohm and Haas Co.
Independence Mall West
Philadelphia, Pa. 19105

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous 99.5% also shipped as 25% - 30% solution in water.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere.** No requirements.
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3:

A B C-A T M N

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Hazard	1
Liquid or Solid Hazard	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 59.11
13.3 **Boiling Point at 1 atm:** 37.2°F = 2.9°C = 276.1°K
13.4 **Freezing Point:** -117.1°F = -82.8°C = 190.3°K
13.5 **Critical Temperature:** 329.2°F = 165.1°C = 438.3°K
13.6 **Critical Pressure:** 591 psia = 40.2 atm = 4.07 MN/m²
13.7 **Specific Gravity:** 0.633 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 19.6 dynes/cm = 0.0196 N/m at -4°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.0
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.149
13.12 **Latent Heat of Vaporization:** 174 Btu/lb = 96.5 cal/g = 4.04 × 10³ J/g
13.13 **Heat of Combustion:** -17,660 Btu/lb = -9,810 cal/g = -410.7 × 10³ J/g
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -99.1 Btu/lb = -214 cal/g = -8.96 × 10³ J/g
13.16 **Heat of Polymerization:** Not pertinent

*Physical properties apply to anhydrous material.

(continued on page 7 and 8)

NOTES

TMC — TRIMETHYLCHLOROSILANE

Common Synonyms

Chlorotrimethylsilane
Trimethylsilyl chloride

Liquid | Colorless | Sharp irritating odor

Reacts violently with water. Irritating gas is produced on contact with water.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR

Irritating to eyes, nose and throat.
Harmful if inhaled.

LIQUID

Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning. Isolate flammables. Restrict access. Evacuate area. Disperse and flush with water.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chlorotrimethylsilane, Trimethylsilyl chloride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** C_3H_9SiCl

3.4 **IMCO/United Nations Numerical Designation:** 1298

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp hydrochloric acid like odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber gloves, chemical worker's goggles, other protective equipment as necessary to protect skin and eyes.

5.2 **Symptoms Following Exposure:** Inhalation of vapor may be irritating to mucous membranes. Contact of liquid with eyes or skin may cause burns. Ingestion may cause irritation and burns of mouth and stomach.

5.3 **Treatment for Exposure:** Get medical attention immediately for all exposures to this compound.
INHALATION: If breathing is difficult, give oxygen. If not breathing, give artificial respiration.
EYES: Flush with water for 15 min.
SKIN: Wash with water.
INGESTION: do NOT induce vomiting. Give large amount of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ (oral, rat) 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is a dangerous irritant to the eyes.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 0°F O.C.

6.2 **Flammable Limits in Air:** 1.8% - 11.1%

6.3 **Fire Extinguishing Agents:** Dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam

6.5 **Special Hazards of Combustion Products:** Toxic oxides of silicon, hydrogen chloride and phosgene may be formed in fire.

6.6 **Behavior in Fire:** Dry chemical, carbon dioxide, or foam extinguishers are recommended. Cool containers with water applied to unburned vapor sources. Vapor may travel to source of ignition and flash back.

6.7 **Ignition Temperature:** 415°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.1 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently with water, producing hydrogen chloride, trimethylsilanol and hexamethyldisiloxane.

7.2 **Reactivity with Common Materials:** Reacts with surfaces moisture to release hydrogen chloride which in turn reacts with metals to release hydrogen gas.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water. Neutralize with mild alkaline materials.

7.5 **Polymerization:** Will not occur

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Corning Corporation
P.O. Box 1767
Midland, Michigan 48640

Stauffer Chemical Company
Westport, Connecticut 06880

Pennwalt Corporation
P.O. Box 7
Rosemont, Pennsylvania 19010

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Dry nitrogen

10.4 **Venting:** Pressure vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

ACO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	
Water	2
Self Reaction	

12.3 **NFPA Hazard Classifications:** not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 108.7

13.3 **Boiling Point at 1 atm:** 135°F = 57°C = 330°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.856 at 24°C (liquid)

13.8 **Liquid Surface Tension:** 19.1 dynes/cm = 0.0191 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 3.7

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1 (est.)

13.12 **Latent Heat of Vaporization:** 134 Btu/lb = 74 cal/g = 2.4 × 10^5 J/kg

13.13 **Heat of Combustion:** -10,300 Btu/lb = -5,700 cal/g = -240 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1-4

NOTES

TGC TRIPROPYLENE GLYCOL

Common Synonyms

Liquid | Colorless | Characteristic odor

May float or sink and mix with water

Stop discharge if possible
Dike for containment
Isolate and deny entry
Notify local authorities and pollution control agencies

Fire

Combustible

Extinguish with dry chemical, CO2, water spray or foam
Water may be ineffective
Cool exposed containers with water

Exposure

LIQUID
Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification:** Glycol ether

3 3 **Chemical Formula:** HO(C3H6O)3CH3OH

3 4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color.** Colorless

4 3 **Odor.** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Plastic gloves, safety glasses or face shield

5 2 **Symptoms Following Exposure** Non irritating, no symptoms observed by any exposure route

5 3 **Treatment for Exposure:** INGESTION if large amounts are swallowed induce vomiting, treat symptomatically EYES or SKIN flush with water, get medical attention if ill effects develop

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 3000 mg/kg (rat)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics** No appreciable hazard. Practically harmless to the skin

5 10 **Odor Threshold** Colorless

6 FIRE HAZARDS

6 1 **Flash Point** 288°F O.C.

6 2 **Flammable Limits in Air.** Data not available

6 3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Acrid fumes of acids and aldehydes may form in fires

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** May attack some forms of plastics

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Union Carbide Corp
Chemicals and Plastics Div
270 Park Avenue
New York, N Y 10017

2 The Dow Chemical Co
2030 Dow Center
Midland, Mich 48640

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** 192.26

13 3 **Boiling Point at 1 atm** 527°F = 273°C = 546°K

13 4 **Freezing Point:** (sets to glass) −49°F = −45°C = 228°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.022 at 20°C (liquid)

13 8 **Liquid Surface Tension** Data not available

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion** (est.) = −13,700 Btu/lb = −7,610 cal/g = −318 × 10^2 kJ/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

TPO — TRIS(AZIRIDINYL)PHOSPHINE OXIDE

Common Synonyms

APO
Tris(1-aziridinyl)phosphine oxide
Phosphoric acid triethylene amide
Triethylenephosphoramide

Solid — White

Mixes with water

[illegible]

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED WHEN HEATED.

Exposure

[illegible]
SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IF INHALED [illegible]
IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 445 4)

Issue warning
corrosive water contaminant
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** APO Phosphoric acid triethylenemide Triethylenephosphoramide Tris(1-aziridinyl) phosphine oxide

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula.** $(CH_2CH_2N)_3PO$ or $C_6H_{12}N_3PO$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Protective clothing and gloves to prevent contact with skin goggles

5 2 **Symptoms Following Exposure** Inhalation (unlikely unless a heavy mist is formed) causes symptoms similar to those observed after ingestion Contact with liquid or powder causes irritation of eyes and (on prolonged contact) irritation and burns of skin Burns are slow to develop and slow to heal May sensitize on repeated contact Ingestion causes depression anorexia and diarrhea appearing 2-3 days before death followed by terminal dyspnea incoordination epistaxis salivation, prostration and exanosis

5 3 **Treatment for Exposure** INHALATION remove victim to fresh air EYES flush with water at once for at least 15 min get medical attention SKIN Flush with water at once followed by vinegar and dilute hydrogen peroxide INGESTION only symptomatic and supportive measures are available

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 4 oral rat LD_{50} = 37 mg/kg

5 7 **Late Toxicity:** None observed

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products:** Phosphoric acid mist may form in fire Toxic oxides of nitrogen may form

6 6 **Behavior in Fire.** Data not available

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction unless in presence of acids or strong caustics

7 2 **Reactivity with Common Materials:** Slow decomposition not considered hazardous

7 3 **Stability During Transport:** Stable if cool

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Violent polymerization occurs at about 25°F Acid fumes also cause polymerization at ordinary temperatures

7 6 **Inhibitor of Polymerization:** None used

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** 5 13 mg/kg LD_{50}

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Chemirad Corporation
P O Box 182
Port Washington N Y 11050

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 85% solution in acetone methylene chloride

10 2 **Storage Temperature:** Below 100°F

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 5 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight** 173 16

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 106°F = 41 C = 314°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity** (H2O = 1 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity.** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Data not available

(Continued on page 5 and 6)

NOTES

TPT TURPENTINE

Common Synonyms
Spirits of turpentine
Turps
Gum turpentine
Wood turpentine

Waterlike liquid Colorless Penetrating unpleasant odor

Floats on water Irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes nose and throat
If inhaled will cause nausea, vomiting headache, difficult breathing, or loss of consciousness

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

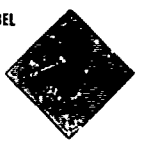
Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
DD turpentine; Sulfate turpentine; Gum turpentine; Turps; Spirits of turpentine; Wood turpentine

3.2 **Coast Guard Compatibility Classification:** Olefin

3.3 **Chemical Formula:** $C_{10}H_{16}$

3.4 **IMCO/United Nations Numerical Designation:** 3.3/1299

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color** Colorless

4.3 **Odor:** Aromatic, rather unpleasant penetrating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Organic canister or supplied-air respirator. Face shield, rubber gloves.

5.2 **Symptoms Following Exposure.** Vapor is irritating and causes headache, confusion, respiratory distress. Liquid irritates skin. If ingested, can irritate the entire digestive system and may cause kidney ailments. If liquid is taken into lungs, it causes severe pneumonia.

5.3 **Treatment for Exposure** INHALATION: remove victim into fresh air and doctor; administer artificial respiration and oxygen if required. INGESTION: give water and induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off; wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** 700 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0.5 to 5 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics** Vapor causes slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 95°F (C.C.)

6.2 **Flammable Limits in Air** 0.8% (LEL)

6.3 **Fire Extinguishing Agents** Foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Burns heavy black smoke and soot

6.7 **Ignition Temperature** 488°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate:** 2.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
100 ppm */fish toxic/fresh water
*Time period not specified

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Hercules Inc.
Hattiesburg, Miss. 39401
2. Tenneco Chemicals, Inc.
Newport Division
Pensacola, Fla. 32501
3. Union Camp Corp.
Chemical Division
Jacksonville, Fla. 32205

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** A wide variety of grades and purities are shipped. All have about the same hazardous properties.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A.1.1

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight** Not pertinent

13.3 **Boiling Point at 1 atm** 302–329°F = 150–165°C = 423–438°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.86 at 15°C (liquid)

13.8 **Liquid Surface Tension.** Data not available

13.9 **Liquid Water Interfacial Tension** 14 dynes/cm = 0.014 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 6

NOTES

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UND	# UNDECANOL

Common Synonyms
Alcohol C-11 (undecyl)
1-Hendecanol
Undecyl alcohol
1-Undecanol

Solid or liquid | Colorless | Mild odor

Floats on water

No pipeline taps permitted
Call Fire department sent
Isolate and deny entry (isolation distance)
Notify local health and pollution control agencies

Fire

Combustible
Explosion and fire hazard

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to eyes
IF IN EYES: Hold eyelids apart and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of downstream water uses

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Hendecanol alcohol 1-Hendecanol n-Hendecylenic alcohol 1-Undecanol Undecyl alcohol Undecylic alcohol
3 2 **Coast Guard Compatibility Classification.** Alcohol
3 3 **Chemical Formula** $CH_3(CH_2)_9CH_2OH$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor.** Faint alcoholic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or faceshield
5 2 **Symptoms Following Exposure:** Liquid can irritate eyes
5 3 **Treatment for Exposure.** Wash eyes with water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits:** No pertinent
5 6 **Toxicity by Ingestion.** Oral rat LD_{50} 0.5 to 5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** None
5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin
5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** 200°F O C
6 2 **Flammable Limits in Air** Data not available
6 3 **Fire Extinguishing Agents.** Foam carbon dioxide or dry chemical
6 4 **Fire Extinguishing Agents Not to be Used** Water or foam (may cause frothing)
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD).** 12.1% (theor.) 5 day, 83% (theor.) 20 day
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 172.30
13 3 **Boiling Point at 1 atm:** 473°F = 245°C = 518°K
13 4 **Freezing Point:** 60.6°F = 15.9°C = 289.1°K
13 5 **Critical Temperature:** 739°F = 393°C = 666°K
13 6 **Critical Pressure** 305 psia = 21 atm = 2.1 MN/m
13 7 **Specific Gravity:** 0.835 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 26.5 dynes/cm = 0.0265 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.032
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** (est.) −18,000 Btu/lb = −10,000 cal/g = −419 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 (next)

NOTES

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UDC

1-UNDECENE

Common Synonyms
n-Nonylethylene

Liquid | Colorless | Mild odor

Floats on water

[illegible]

Fire

Combustible
Extinguish with [illegible]
Water may be ineffective
Cool exposed [illegible] with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
FIRE [illegible]
IF IN EYES hold eyelid open and flush with plenty of water
IF SWALLOWED [illegible] DO NOT induce vomiting
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** n-Nonylethylene
3 2 **Coast Guard Compatibility Classification:** Olefin
3 3 **Chemical Formula:** $CH_2CH(CH_2)_7CH_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color.** Colorless
4 3 **Odor:** Mild pleasant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Aspiration hazard if ingested. Slight skin and eye irritation. No sensitization hazard expected
5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air. INGESTION do NOT lavage or induce vomiting, give vegetable oil and demulcents, call a doctor. EYES flush with water for 15 min. SKIN wipe off, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Slight smarting of eyes and respiratory system at high concentrations. The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 160°F OC
6 2 **Flammable Limits in Air** Data not available
6 3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** 4 x mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

[illegible]
Derby Street
North Haven, Conn 06473

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XTU

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight.** 154.2
13 3 **Boiling Point at 1 atm:** 378.9°F = 192.7°C = 465.9°K
13 4 **Freezing Point.** [illegible] = -30°C = 225°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.750 at 20°C (liquid)
13 8 **Liquid Surface Tension** 23.4 dynes/cm = 0.0234 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** (est.) 50 dynes/cm = 0.050 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13 12 **Latent Heat of Vaporization.** 154 Btu/lb = 85.8 cal/g = 3.59×10^5 J/kg
13 13 **Heat of Combustion** = -19,084 Btu/lb = -10,602 cal/g = -44.39×10^5 J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and A

NOTES

UDB	n-UNDECYLBENZENE

Common Synonyms			
1-Phenylundecane	Liquid	Colorless	Mild odor
	Floats on water		

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1-Phenylundecane
3 2 **Coast Guard Compatibility Classification:** Not Listed
3 3 **Chemical Formula:** $C_6H_5(CH_2)_{10}CH_3$
3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield and rubber gloves
5 2 **Symptoms Following Exposure:** Ingestion may cause intestinal disturbances. Contact with eyes causes mild irritation
5 3 **Treatment for Exposure:** INGESTION induce vomiting if large amount has been swallowed. EYES flush with water. SKIN remove spills on skin or clothing by washing with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 285°F C C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 The Humphrey Chemical Co
Devine Street
North Haven Conn 06473

2 Conoco Chemicals
Park 80 Plaza Two
Saddle Brook N J 07662

3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Mixture with decylbenzene and dodecylbenzene, all of which have same general properties
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 232.4
13 3 **Boiling Point at 1 atm:** 601°F = 316°C = 589°K
13 4 **Freezing Point:** 23°F = −5°C = 268°K
13 5 **Critical Temperature:** 918.1°F = 492.3°C = 765.5°K
13 6 **Critical Pressure:** 234 psia = 15.9 atm = 1.61 MN/m²
13 7 **Specific Gravity:** 0.855 at 20°C (liquid)
13 8 **Liquid Surface Tension.** Data not available
13 9 **Liquid-Water Interfacial Tension.** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** 101.77 Btu/lb = 56.26 cal/g = 2.354 × 10⁵ J/kg
13 13 **Heat of Combustion.** −19,490 Btu/lb = −10,830 cal/g = −453.1 × 10³ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5a-65

NOTES

URA	# URANYL ACETATE

Common Synonyms
Uranyl acetate dihydrate
Uranium acetate
Uranium oxyacetate dihydrate
Bis (acetate) dioxouranium
Uranium acetate dihydrate

Solid | Yellow | Slight vinegar odor

Sinks and mixes slowly with water

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Bis(acetato-)dioxouranium, Uranium acetate, Uranium acetate dihydrate, Uranium oxyacetate dihydrate, Uranyl acetate dihydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $UO_2(CH_3COO)_2 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Yellow
4 3 **Odor:** Slight vinegar

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved dust respirator, goggles or face shield, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Contact with eyes can cause irritation.

5 3 **Treatment for Exposure:** *Get medical attention after all exposures to this compound.* INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (as uranium)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$: 1 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Dissolves and reacts to give a milky solution. The reaction is not hazardous

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 37 ppm/96 hr fathead minnow TL$_m$ soft water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Varlacoid Chemical Co
666 South Front St
Elizabeth, N J 07202

2 J T Baker Chemical Co
Phillipsburg, N J 08865

3 Mallinckrodt Chemical Works
2nd and Mallinckrodt St
St Louis, Mo 63160

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial, Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Radioactive material

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 424.2

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.89 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

UAN — URANYL NITRATE

Common Synonyms

Uranium nitrate

Solid | Light yellow | Odorless

Mixes with water

[illegible]

Fire

Not flammable
May cause fire on contact with combustibles.
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

[illegible]

DUST

Irritating to eyes, nose and throat
Harmful if inhaled
[illegible]

SOLID

Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: radioactive oxidizing material, water contaminant
Restrict access
Disperse and flush

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Uranium nitrate
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $UO_2(NO_3)_2 \cdot 6H_2O$
3.4 **IMCO/United Nations Numerical Designation:** 7/[illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Pale yellow
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, gloves, goggles

5.2 **Symptoms Following Exposure:** Excessive inhalation of dust may cause irritation of lungs and delayed symptoms similar to those observed after ingestion. Dust irritates eyes and skin and may be absorbed through skin on prolonged exposure. Ingestion causes irritation of mouth and stomach, inflammation of kidneys and liver develops 1 to 4 days after exposure.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. EYES: flush with water for at least 15 min., see physician if irritation persists. SKIN: wash thoroughly with soap and water. INGESTION: administer large doses of sodium bicarbonate (This will convert the uranium salt to the bicarbonate which is much less toxic.) Additional treatment is symptomatic, get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, LD_{50} 50 to 500 mg/kg

5.7 **Late Toxicity:** Delayed inflammation of kidneys. Airborne radioactive particles have apparently been responsible for a significantly increased death rate from lung cancer among long term uranium miners.

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable, but may cause fire on contact with combustibles.
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Flooding amounts of water
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen formed in fires
6.6 **Behavior in Fire:** Intensifies fires. When large quantities are involved, nitrate may fuse or melt; application of water may then cause excessive scattering of molten material.
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves forming weak solution of nitric acid the reaction is not hazardous
7.2 **Reactivity with Common Materials:** In contact with easily oxidizable substances may react rapidly enough to cause ignition, violent combustion or explosion. Water solutions are acidic and can corrode metals.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Wash with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 3.1 mg L/96 hr, fathead minnow TL_m, fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1. The S. W. Shattuck Chemical Co., Inc.
1805 South Bannock Street
Denver, Colo. 80223

2. J. T. Baker Chemical Co.
222 Red School Lane
Phillipsburg, N. J. 08865

3. Mallinckrodt Chemical Works
223 West Side Avenue
P. O. Box 384
Jersey City, N. J. 07305

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Analytical reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Radioactive material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	1
Flammability (Red)	0	0
Reactivity (Yellow)	0	2
	OXY	OXY

*First column refers to normal fire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 502.13
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 140.4°F = 60.2°C = 333.4°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.81 at 13°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 4 and 6)

NOTES

URS

URANYL SULFATE

Common Synonyms
Uranyl sulfate trihydrate
Uranium sulfate
Uranium sulfate trihydrate

Solid | Yellow | Odorless

Sinks and mixes with water

Avoid contact with solid or dust. Keep upwind.
Stop discharge if possible.
Isolate or retrieve discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If on skin, flush with plenty of water
If in eyes, flush with plenty of water
If swallowed, induce vomiting

SOLID
Irritating to skin and eyes
Harmful if swallowed

Remove contaminated clothing.
Flush skin with plenty of water
IF IN EYES hold eyelids apart and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS, give two glasses of water
and induce vomiting
IF SWALLOWED and victim UNCONSCIOUS, OR HAVING CONVULSIONS
do not induce vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify local health and pollution control agencies.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Restrict access
Disperse and flush

2. LABEL

RADIOACTIVE

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Uranium sulfate, Uranium sulfate trihydrate, Uranyl sulfate trihydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $UO_2SO_4 \cdot 3H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved dust respirator, goggles or face shield, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Contact with eyes causes irritation

5 3 **Treatment for Exposure:** *Get medical attention after all exposures to this compound.* INGESTION give large amounts of water, induce vomiting. EYES flush with water for at least 15 min. SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (as uranium)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ 1.5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
135 ppm/96 hr fathead minnow/TLm hard water
218 ppm/96 hr fathead minnow TLm soft water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Varlacoid Chemical Co
666 South Front St
Elizabeth N J 07202

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

3 Ventron Corp
P O Box 159
Beverly Mass 01915

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial, Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Radioactive material

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 420.2

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 3.28 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

URE	UREA

Common Synonyms
Carbamide
Carbonildiamide

Solid crystals or pellets White Odorless

Sinks and mixes with water

Fire

Combustible

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Dispersal and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Carbamide
Carbonildiamide

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** NH_2CONH_2

3 4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Odorless or very faint ammonia odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield should be worn

5 2 **Symptoms Following Exposure:** May irritate eyes

5 3 **Treatment for Exposure:** Wash eyes with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Not available

5 9 **Liquid or Solid Irritant Characteristics:** None

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Melts and decomposes generating ammonia

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Occurs only above melting point (132°C) yielding ammonia and other products. The decomposition is not explosive

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
96-hour TL$_m$ (24°C) over chronic aerated fresh water
24-hour TL$_m$ (24°C) over chronic unaerated fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 0 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Agricultural Division
Morristown, NJ 07960

2 Lone Star Gas Co
Natural Resources
Dallas, Tex 75221

3 Triad Chemical Co
Yazoo City, Miss 39194

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Various grades and purities which depend on manufacturing process and intended use. All have essentially the same hazards properties

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 60.06

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** 270°F = 132°C = 405°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 1.32 (20°C/4°C)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** = -113 Btu/lb
= -63 kcal/g = -2.64 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** +108 Btu/lb
= +60 kcal/g = +2.52 × 10^5 J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

UPO — UREA PEROXIDE

Common Synonyms

Urea hydrogen peroxide
Hydrogen peroxide carbamide
Urea hydrogen peroxide salt
Carbamide peroxide
Carbonyl diamine peroxide

Solid | White | Odorless

Mixes with water

Fire

Combustible
May cause fire on contact with combustibles
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire

Exposure

SOLID
Irritating to skin and eyes.

Water Pollution

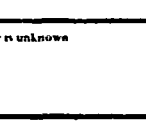
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-1)

Issue warning - oxidizing material
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Carbamide peroxide, Carbonyl diamine peroxide, Hydrogen peroxide carbamide, Percarbamide, Perhydrol Urea, Urea hydrogen peroxide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CON_2H_6O_3$

3.4 **IMCO/United Nations Numerical Designation:** NA 1511

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, protective goggles

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose from hydrogen peroxide formed when heated. Contact with eyes causes severe damage. Contact with moist skin causes temporary itching or burning sensation. Ingestion causes irritation of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION remove victim from exposure, call physician. EYES wash thoroughly with large quantities of water for at least 15 min., call physician. SKIN: flush with water. INGESTION give large quantities of water, get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid that cause fire upon contact with ordinary combustibles)

6.2 **Flammable Limit in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Inert powders (e.g., sand, limestone), water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating ammonia gas may be formed in fire

6.6 **Behavior in Fire:** Melts and decomposes giving off oxygen and ammonia. Increases severity of fire. Containers may explode

6.7 **Ignition Temperature:** >640°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms solution of hydrogen peroxide (non-hazardous reaction)

7.2 **Reactivity with Common Materials:** No significant reaction at ordinary temperatures. At 50°C (122°F) reacts with dust and rubbish

7.3 **Stability During Transport:** Stable below 60°C (140°F)

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. The Norac Company, Inc.
   405 South Motor Avenue
   P.O. Box 1
   Azusa, Calif. 91702
2. Degussa Incorporated
   Chemicals Division
   2 Pennsylvania Plaza
   New York, N.Y. 10001
3. Gallard-Schlesinger Chemical Mfg. Co.
   584 Mineola Avenue
   Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 98, 100%

10.2 **Storage Temperature:** Below 60°C (140°F)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open, flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-2)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 94.1

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** −540 Btu/lb = −300 cal/g = −12.5 × 10⁵ J/kg

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page Card 6

NOTES

VAL	# VALERALDEHYDE

Common Synonyms
Amyl aldehyde
Valeric aldehyde
Pentanal
Valeral

Waters liquid Colorless Fruity odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.

LIQUID
Irritating to skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Isolate area. Keep unnecessary people away.
Evacuate area.
Disperse vapor.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Amyl aldehyde
Pentanal
Valeral
Valeric aldehyde

3.2 **Coast Guard Compatibility Classification:** Validity

3.3 **Chemical Formula:** $C_5H_{10}O$

3.4 **IMCO United Nations Numerical Designation.** 1.2.N.x

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Fruity

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles. Self-contained breathing apparatus.

5.2 **Symptoms Following Exposure:** Vapor irritating to eyes, nose and throat. Liquid irritating to skin and eyes.

5.3 **Treatment for Exposure:** EYES: Flush with water for 15 minutes. SKIN: Wash with soap and water. INHALATION: Remove to fresh air. Apply artificial respiration if not breathing.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available.

5.5 **Short-Term Inhalation Limits:** Data not available.

5.6 **Toxicity by Ingestion.** Grade 1. Data not available.

5.7 **Late Toxicity:** Data not available.

5.8 **Vapor (Gas) Irritant Characteristics** Vapor irritating to eyes, nose and throat. Irritation is slight at 100 ppm. Severe irritation at 200 ppm. Dangerous at 500 ppm.

5.9 **Liquid or Solid Irritant Characteristics** Minimum Standard Irritant. Liquid irritating to skin and eyes. Irritation is slight at 100 ppm. Severe irritation at 200 ppm. Dangerous at 500 ppm.

5.10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point:** 54°F CC

6.2 **Flammable Limits in Air:** Data not available.

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.

6.5 **Special Hazards of Combustion Products:** Not pertinent.

6.6 **Behavior in Fire:** Not pertinent.

6.7 **Ignition Temperature:** Data not available.

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** 1.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.

7.2 **Reactivity with Common Materials:** No reaction.

7.3 **Stability During Transport:** Stable.

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization.** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD)** 2% (theory) 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, New York

10 SHIPPING INFORMATION

*10.1 **Grades of Purity:** 99.5%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

*10.4 **Venting.** Open. Pressure or vacuum relief valve required.

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3.

V-P-Q-T-U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
I	
Hazard	
Vapor	
Fire	
Reactivity	
Water Pollution	
Toxicity	
Corrosivity	
Combustibility	
Reactivity	
Water	
Spoilage	

*12.3 **NFPA Hazard Classifications** Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 86.13

13.3 **Boiling Point at 1 atm:** 204°F = 96°C = 369.2 K

13.4 **Freezing Point:** -121°F = -90°C = 183 K

*13.5 **Critical Temperature:** 503°F = 262°C = 535 K

*13.6 **Critical Pressure:** 714 psia = 49 atm = 4.9 MN/m²

*13.7 **Specific Gravity:** 0.8109 @ 20°C (liquid)

*13.8 **Liquid Surface Tension:** 24.6 dynes/cm = 0.0246 N/m @ 20°C

*13.9 **Liquid-Water Interfacial Tension:** 10.1 dynes/cm = 0.0101 N/m @ 20°C

*13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.07

13.12 **Latent Heat of Vaporization:** 167 Btu/lb = 93 cal/g = 3.9 kJ/g

13.13 **Heat of Combustion:** -14,100 Btu/lb = -7830 cal/g = -327.8 kJ/g

13.14 **Heat of Decomposition:** Not pertinent.

13.15 **Heat of Solution:** Not pertinent.

13.16 **Heat of Polymerization:** Not pertinent.

* Recommended by NAS Panels

NOTES

REVISED 1978

VOT — VANADIUM OXYTRICHLORIDE

Common Synonyms
Vanadyl trichloride
Trichlorovanadium
Vanadyl chloride

Liquid | Lemon yellow | Sharp unpleasant odor

Sticks and fumes violently with water

Fire

Not flammable

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Isolate hazard area and deny entry
Restrict access
Dispose and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Trichlorooxovanadium
Vanadium(V) oxide trichloride
Vanadyl trichloride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $VOCl_3$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Lemon yellow

4 3 **Odor:** Acrid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Acid vapor mask, rubber gloves, face shield, acid resistant clothing

5 2 **Symptoms Following Exposure:** Inhalation of vapor causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes severe irritation

5 3 **Treatment for Exposure:** Call a physician after all exposures to this compound. INHALATION: move to fresh air, give artificial respiration if not breathing, call physician. INGESTION: give large amounts of water. EYES: flush with water for 15 minutes. SKIN: wash exposed areas free of the chemical with a dry cloth, then flush thoroughly with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Exposure to burning area is hazardous due to fact that compound decomposes in moist air into vanadic acid and HCl

5 6 **Toxicity by Ingestion:** Grade 3 Minimal LD_{50} = 2 mg/kg

5 7 **Late Toxicity:** Repeated exposures may cause discoloration of tongue, loss of appetite, anemia, kidney disorders, and blindness

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** 10 ppm (HCl found on decomposition of compound in moist air)

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Water unless in flooding amounts should not be used on adjacent fires

6 5 **Special Hazards of Combustion Products:** Evolution of hydrogen chloride may accompany fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts to form a mixture of hydrochloric acid

7 2 **Reactivity with Common Materials:** In presence of moisture will corrode most metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water and neutralize with powdered limestone or rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** See remarks section

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

Lunge Mineral Co
Reno (NV)
Tel: Pa (Area)

2 Stauffer Chemical Company
Specialty Chemical Div
Westport, Conn 06880

3 Vertac Inc
P O Box 129
Beverly, Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 95%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

XO1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 173.3

13 3 **Boiling Point at 1 atm:** 256°F = 124°C = 397°K

13 4 **Freezing Point:** -86°F = -66°C = 207°K

13 5 **Critical Temperature:** Data not available

13 6 **Critical Pressure:** Data not available

13 7 **Specific Gravity:** 1.81 @ 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 5.99

13 11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

(continued on page 2 and 4)

NOTES

VOX — VANADIUM PENTOXIDE

Common Synonyms			
Vanadic anhydride Vanadium pentoxide	Solid	Yellowish brown	Odorless
	Sinks in water		

Fire

Not flammable
Will increase the intensity of a fire

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Should be contained
Chemical and physical treatment

2. LABELS

No hazard label required by U.S. Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Vanadic anhydride
Vanadium pentoxide

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** V_2O_5

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Yellow-orange powders darken on exposure to yellowish-brown

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator (self-contained breathing apparatus) for exposure to dust. Protective clothing for prolonged exposure.

5.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation. Eczema may develop.

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air. Respiratory distress may be relieved by administration of oxygen. If INHALATION ceases, administer artificial respiration. EYES: flush with water for at least 15 min. SKIN: flush with water. Wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Rat LD_{50}: 10 mg/kg

5.7 **Late Toxicity:** Repeated exposure may cause discoloration of the eyes, loss of appetite, stomach disorders, and weakness

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May increase intensity of fire when in contact with combustible materials

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
96 ppm Static Bioassay in Fresh water
Copper Salt Bioassay in Marine Water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

Kerr-McGee Chemical Corp.
Oklahoma City, Oklahoma

Stauffer Chemical Co.
Westport, Connecticut

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 99+% V₂O₅

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 181.88

13.3 **Boiling Point at 1 atm:** Not pertinent
decomposes

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 3.36 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(continued on next page)

NOTES

VSF	# VANADYL SULFATE

Common Synonyms	Solid	Pale blue	Odorless
Vanadium oxysulfate Vanadyl sulfate dihydrate	Sinks and mixes with water		

As it is mixed with solid and [illegible]
Stop discharge if possible
Isolate and remove [illegible]
Notify [illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

[illegible] with plenty of water
[illegible]
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea or coughing

[illegible]
[illegible] with plenty of water
IF IN EYES [illegible] with plenty of water
IF SWALLOWED [illegible] CONSCIOUS [illegible] water [illegible]
[illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-6)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Vanadium oxysulfate
Vanadyl sulfate dihydrate

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula** $VOSO_4 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Pale blue

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation, eczema may develop. (Results of prolonged exposure are described in section 5.7)

5 3 **Treatment for Exposure:** INHALATION: move to fresh air, if exposure to dust has been severe get medical attention. INGESTION: give large amount of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, LD_{50} 500 mg/kg

5 7 **Late Toxicity:** Repeated exposures may cause discoloration of tongue, loss of appetite, anemia, kidney disorders, and blindness

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
36 ppm/96 hr/fathead minnow/TL_m/hard water
4.8 ppm/96 hr/fathead minnow/TL_m/soft water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Mfg. Co.
584 Mineola Ave.
Carle Place, N. Y. 11514

2 Eastman Organic Chemicals
Rochester, N. Y. 14650

3 Ventron Inc.
P. O. Box 159
Beverly, Mass. 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial, Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 199.1

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (approx.) 2.5 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

VAM VINYL ACETATE

Common Synonyms
VyAc
Vinyl A monomer

Waters liquid Colorless Pleasant fruity odor

Floats on water Flammable irritating vapor is produced

Stop discharge if possible Keep people away
Wear protective clothing as called for by [illegible]
Avoid contact with liquid and vapor
Stay upwind and on water shown to keep [illegible]
Ventilate closed spaces before entering
Notify [illegible]

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus
Cool containers with water from maximum protected distance
Extinguish with dry chemical, CO2, water spray or foam
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause dizziness or difficult breathing
[illegible]
If in eyes hold eyelids apart and flush continuously with water
If inhaled remove to fresh air

LIQUID
Irritating to skin and eyes
Harmful if swallowed or if spilled on skin
Remove contaminated clothing
Wash skin with soap and water
IF IN EYES hold eyelids apart and flush continuously with water
IF SWALLOWED [illegible] DO NOT induce vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
Notify [illegible]
Notify [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning: high flammability
air contaminant
Evacuate area

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** VAM
Vinyl Monomer
VyAc

3 2 **Coast Guard Compatibility Classification.** Vinyl acetate

3 3 **Chemical Formula:** $CH_3COOCH{=}CH_2$

3 4 **IMCO/United Nations Numerical Designation.** 3 2 130t

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color.** Colorless

4 3 **Odor** Not unpleasant, sweet smell in small quantities, pleasant fruity characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Approved canister or air supplied mask, goggles or face shield, rubber or plastic gloves

5 2 **Symptoms Following Exposure** High vapor concentrations cause narcosis, Liquid irritates eyes and may irritate skin

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air, give artificial respiration if required EYES flush with water for at least 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 10 ppm

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 5 to 9 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold.** 0 12 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 18 °C CC 25 °F OC

6 2 **Flammable Limits in Air** 2 6 13 4

6 3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, ordinary foam for large ones

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire.** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back May polymerize when heated in a fire and rupture container

6 7 **Ignition Temperature** 800 F

6 8 **Electrical Hazard** Class I, Group I

6 9 **Burning Rate.** 3 8 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Can occur when in contact with peroxides and strong acids but only under extreme conditions

7 6 **Inhibitor of Polymerization** 3 5 ppm or 14 17 ppm hydroquinone Shipping walls also contain 200 ppm of diphenylamine

8. WATER POLLUTION

8 1 **Aquatic Toxicity**
19 ppm/96 hr bluegill [illegible] fresh water
>100 ppm/48 hr flounder [illegible] salt water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
62% of theoretical in 5 days, freshwater, acclimated seed

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Celanese Corp
Celanese Chemical Co Division
245 Park Ave
New York, N Y 10017

2 National Distillers & Chemical Corp
U S Industrial Chemicals Co Division
Houston, Tex 77001

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:**
Grade A (Diphenylamine inhibited) 99 %
Grade B (Hydroquinone inhibited) 99 %

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting** Pressure/vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-444-3

A P-2-T-U-V W Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight** 86 09

13 3 **Boiling Point at 1 atm**
163 2 F = 72 9°C = 346 1 K

13 4 **Freezing Point:**
−138 0 F = −92 8 C = 180 4 K

13 5 **Critical Temperature**
486 F = 252 C = 525 K

13 6 **Critical Pressure.**
617 atm = 42 psia = 4 25 MN/m²

13 7 **Specific Gravity** 0 933 at 20/20 C (liquid)

13 8 **Liquid Surface Tension:**
23 05 dynes/cm = 0 02305 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension:**
(est) 30 dynes/cm = 0 03 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
1 103

13 12 **Latent Heat of Vaporization** 166 Btu/lb
= 90 6 cal/g = 3 79 × 10⁵ J/kg

13 13 **Heat of Combustion** −4784 Btu/lb
= −9419 cal/g = −226 9 × 10⁵ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** −439 Btu/lb
= −244 cal/g = −10 2 × 10⁵ J/kg

Continued on page 5 and 6

NOTES

REVISED 1978

VCM — VINYL CHLORIDE

Common Synonyms
Chloroethylene
VCL
Vinyl Chloride Monomer

Liquefied compressed gas Colorless Sweet odor

Liquid floats and boils on water. Flammable. Irritating vapor cloud is produced.

Fire

FLAMMABLE.
POISONOUS GAS IS PRODUCED IN FIRE.
Flashback along vapor trail may occur.
May explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or difficult breathing.

LIQUID
Will cause frostbite.

Water Pollution

Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning. High flammability.
Evacuate area.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chloroethene
Chloroethylene
Vinyl Chloride Monomer
VCE
VCM

3.2 **Coast Guard Compatibility Classification:** Vinyl halides

3.3 **Chemical Formula:** $CH_2=CHCl$

3.4 **IMCO/United Nations Numerical Designation:** 2.0 1086

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied gas

4.2 **Color:** Colorless

4.3 **Odor:** Pleasant, sweet

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Rubber gloves and shoes, gas tight goggles, organic vapor canister or self-contained breathing apparatus.

5.2 **Symptoms Following Exposure:** INHALATION: high concentrations caused dizziness, anesthetic, lung irritation. SKIN: may cause frostbite; phenol inhibitor may be absorbed through skin. If large amounts of liquid evaporate.

5.3 **Treatment for Exposure.** INHALATION: remove patient to fresh air and keep him quiet and warm; call a doctor; give artificial respiration if breathing stops. EYES AND SKIN: flush with plenty of water for at least 15 min.; for eyes get medical attention; remove contaminated clothing.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5.5 **Short-Term Inhalation Limits:** 500 ppm for 5 min.

5.6 **Toxicity by Ingestion.** Not pertinent.

5.7 **Late Toxicity:** Chronic exposure may cause liver damage.

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. May cause frostbite.

5.10 **Odor Threshold:** 260 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** −110°F (O.C.)

6.2 **Flammable Limits in Air:** 4% - 26%

6.3 **Fire Extinguishing Agents:** For small fire, use dry chemical or carbon dioxide. For large fires, stop flow of gas. Cool exposed containers with water.

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent.

6.5 **Special Hazards of Combustion Products.** Forms highly toxic combustion products such as hydrogen chloride, phosgene and carbon monoxide.

6.6 **Behavior in Fire.** Container may explode in fire. Gas is heavier than air and may travel considerable distance to a source of ignition and flash back.

6.7 **Ignition Temperature:** 882°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 4.3 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Polymerizes in presence of air, sunlight or heat unless stabilized by inhibitors.

7.6 **Inhibitor of Polymerization.** Not normally used except when high temperatures are expected. Then 40-100 ppm of phenol used.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. The B.F. Goodrich Co.
6100 Oak Tree Blvd.
Cleveland, Ohio 44131
3. PPG Industries, Inc.
Chemical Division
Guayanilla, Puerto Rico 00656

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial or technical 99+%

10.2 **Storage Temperature:**
Under pressure: ambient
At atm. pressure: low

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.**
Under pressure: safety relief
At atm. pressure: pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 448-3)

A B C D E F G Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aquatic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	2

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 62.50

13.3 **Boiling Point at 1 atm:**
7.2°F = −13.8°C = 259.4°K

13.4 **Freezing Point:**
−244.8°F = −153.8°C = −119.4°K

13.5 **Critical Temperature:**
317.1°F = 158.4°C = 431.6°K

13.6 **Critical Pressure:**
775 psia = 52.7 atm = 5.34 MN/m

13.7 **Specific Gravity:** 0.969 at −13°C (liquid)

13.8 **Liquid Surface Tension:**
16.0 dynes/cm = 0.0160 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:** (est.)
30 dynes/cm = 0.03 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 2.2

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.186

13.12 **Latent Heat of Vaporization:**
160 Btu/lb = 88 cal/g = 3.7 × 10⁵ J/kg

13.13 **Heat of Combustion:** −8136 Btu/lb
= −4520 cal/g = −189.1 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** −729 Btu/lb
= −405 cal/g = −16.9 × 10⁵ J/kg

Continued on pages 5 and 6

NOTES

REVISED 1978

VFI — VINYL FLUORIDE, INHIBITED

Common Synonyms

Fluoroethylene
Monofluoroethylene

Liquefied compressed gas Colorless Faint odor

Floats and boils on water Flammable visible vapor cloud is produced

[illegible]

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR

If inhaled will cause headache, or dizziness
[illegible]

LIQUID

Will cause frostbite
[illegible]
DO NOT RE-BEAT [illegible]

Water Pollution

Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
air contaminant
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Fluoroethylene
Monofluoroethylene

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula.** $CH_2=CHF$

3 4 **IMCO/United Nations Numerical Designation** 2-1860

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquefied compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** Faint ethereal

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Protective gloves, safety glasses, self contained breathing apparatus

5 2 **Symptoms Following Exposure:** Inhalation of vapor causes slight intoxication, some shortness of breath. Liquid may cause frostbite of eyes or skin

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. SKIN: if frostbite has occurred, immerse in warm water; treat burn

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Not pertinent (gas at normal temperatures)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available.

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

Flash Point Not pertinent (flammable compressed liquefied gas)

6 2 **Flammable Limits in Air** 2.6% - 21.7%

6 3 **Fire Extinguishing Agents** Let fire burn; shut off flow of gas; cool adjacent containers with water

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic hydrogen fluoride gas is generated in a fire

6 6 **Behavior in Fire** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode

6 7 **Ignition Temperature** 725°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** In the absence of inhibitor polymerization can occur

7 6 **Inhibitor of Polymerization** Terpene B 0.2%

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity** None

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 E I duPont de Nemours & Co Inc
Organic Chemicals Department
Freon Products Division
Nemours Building
Wilmington, Del 19898

2 Matheson Gas Products Co
East Rutherford, N J 07073

3 Scientific Gas Products Inc
513 Raritan Center
Edison, N J 08817

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99.9+

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C-D E F-G Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not Listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Gas

13 2 **Molecular Weight:** 46.1

13 3 **Boiling Point at 1 atm:**
-98°F = -72°C = 201°K

13 4 **Freezing Point:**
-258°F = -161°C = 112°K

13 5 **Critical Temperature.**
130.5°F = 54.7°C = 327.9°K

13 6 **Critical Pressure**
760 psia = 51.6 atm = 5.23 MN/m²

13 7 **Specific Gravity:** 0.707 at 0°C (liquid)

13 8 **Liquid Surface Tension** 9 dynes/cm = 0.009 N/m at 15°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 1.6

13 11 **Ratio of Specific Heats of Vapor (Gas).** 1.2097

13 12 **Latent Heat of Vaporization** 156 btu/lb = 86.5 cal/g = 3.62 × 10⁵ J/kg

13 13 **Heat of Combustion** (est.) = -6,580 Btu/lb = -3,660 cal/g = -153 × 10⁵ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Data not available

Continued on page 5 and 6

NOTES

VCI — VINYLIDENE CHLORIDE, INHIBITED

Common Synonyms
1,1-Dichloroethylene
unsym-Dichloroethylene

Watery liquid | Colorless | Sweet odor

Sinks in water. Flammable, irritating vapor is produced.
Boiling point is 99°F.

[illegible]

Fire

FLAMMABLE.
POISONOUS GASES PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
[illegible]

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or difficult breathing.
[illegible]

LIQUID
Will burn eyes and skin.
Harmful if swallowed.
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning: high flammability.
Evacuate area.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,1-Dichloroethylene; unsym-Dichloroethylene

3.2 **Coast Guard Compatibility Classification:** Vinyl halides

3.3 **Chemical Formula:** $C_2H_2Cl_2$

3.4 **IMCO United Nations Numerical Designation:** 3.1 1303

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweet; like carbon tetrachloride or chloroform

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved canister or air supplied mask; rubber gloves; butyl rubber gloves and boots.

5.2 **Symptoms Following Exposure:** Vapor can cause dizziness, irritation, narcosis, pulmonary edema. Liquid irritating to eyes and skin.

5.3 **Treatment for Exposure:** INHALATION: if any illness develops, remove person to fresh air, prompt; keep warm and quiet, and get medical attention. If breathing stops, start artificial respiration. INGESTION: not likely a problem; no known antidote; treat symptomatically. EYE OR SKIN: flush with plenty of water for at least 15 minutes; get medical attention for eyes. Remove contaminated clothing and wash before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 20 ppm (recommended)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, Oral LD_{50} adult = 84 mg/kg (adrenalectomized rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes moderate irritation of eyes, nose, throat; will lead to headache, excitation, unpleasant. The odor is imperceptible.

5.9 **Liquid or Solid Irritant Characteristics:** Causes burning sensation; skin will first degrease, later on short exposure may cause secondary burns; severe burning on exposure.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 0°F (O.C.)

6.2 **Flammable Limits in Air:** 7.3% - 16.0%

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene are generated in fires.

6.6 **Behavior in Fire:** May explode in fire due to polymerization. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.

6.7 **Ignition Temperature:** 900°F - 1031°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Copper and aluminum can cause polymerization

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Can occur if exposed to sunlight, air, copper, aluminum, heat

7.6 **Inhibitor of Polymerization:** 200 ppm ethyl ether of hydroquinone (0.02% by weight)

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. PPG Industries, Inc.
Industrial Chemicals Division
1 Gateway Center
Pittsburgh, Pa. 15222
3. Vulcan Materials Co.
Chemicals Division
Wichita, Kans. 67201

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Padded

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-X-Y-Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Liquid

13.2 **Molecular Weight:** 96.95

13.3 **Boiling Point at 1 atm.:**
88.9°F = 31.6°C = 304.8°K

13.4 **Freezing Point:**
−187.6°F = −122.0°C = 151.2°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.21 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
24 dynes/cm = 0.024 N/m at 15°C

13.9 **Liquid-Water Interfacial Tension:**
37 dynes/cm = 0.037 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** 3.3

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Data not available

13.12 **Latent Heat of Vaporization:**
150 Btu/lb = 72 cal/g = 3.0 × 10^5 J/kg

13.13 **Heat of Combustion:** −4660 Btu/lb
= −2700 cal/g = −11.3 × 10^6 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** −333 Btu/lb
= −185 cal/g = −7.75 × 10^5 J/kg

Continued on next page

NOTES

REVISED 1978

VME	VINYL METHYL ETHER, INHIBITED

Common Synonyms

Methyl vinyl ether
Methoxyethylene

Liquefied compressed gas Colorless Sweet pleasant odor

Floats and may boil on water. Boiling point is 54° F.

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness, or loss of consciousness

LIQUID
Irritating to eyes
Will cause frostbite
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning: high flammability
air contaminant
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Methoxyethylene
Methyl vinyl ether

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula.** $CH_2=CH-O-CH_3$

3 4 **IMCO/United Nations Numerical Designation.** 2 1087

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** Sweet pleasant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor mask, plastic or rubber gloves, safety glasses

5 2 **Symptoms Following Exposure:** Inhalation causes irritation, blurring of vision, headache, dizziness, excitation, loss of consciousness. Liquid or concentrated vapor irritates eyes and skin. Frostbite of skin. Aspiration of the liquid will cause chemical pneumonitis

5 3 **Treatment for Exposure.** INHALATION: remove victim to fresh air. If breathing is difficult, administer oxygen. Call physician. EYES: wash with copious quantities of water; consult an eye specialist. SKIN: wash with copious quantities of water; treat frostbite by use of warm water or blankets. INGESTION: do NOT induce vomiting; get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0.5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** −69°F (C.C.)

6 2 **Flammable Limits in Air:** 2.6 - 39

6 3 **Fire Extinguishing Agents.** Let fire burn; shut off gas flow; extinguish small fires with dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Containers may explode. Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly to form acetaldehyde; reaction is not hazardous unless water is hot or acids are present

7 2 **Reactivity with Common Materials:** Acids will cause polymerization

7 3 **Stability During Transport:** Stable if kept free from acids

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Can polymerize in the presence of acids

7 6 **Inhibitor of Polymerization:** Diisobutylamine, Triethanolamine, Solid potassium hydroxide

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 GAF Corporation
140 West 51st Street
New York, N.Y. 10020

2 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

3 Matheson Gas Products Co.
East Rutherford, N.J. 07073

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99.7+ %

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C D E F G Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Gas

13 2 **Molecular Weight:** 58.1

13 3 **Boiling Point at 1 atm:** 41.9°F = 5.5°C = 278.7°K

13 4 **Freezing Point.** −218°F = −122°C = 151°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.777 at 0°C (liquid)

13 8 **Liquid Surface Tension.** (est.) 10 dynes/cm = 0.010 N/m at 0°C

13 9 **Liquid-Water Interfacial Tension.** (est.) 25 dynes/cm = 0.025 N/m at 0°C

13 10 **Vapor (Gas) Specific Gravity:** 2.0

13 11 **Ratio of Specific Heats of Vapor (Gas)** (est.) 1.143

13 12 **Latent Heat of Vaporization:** (est.) 180 Btu/lb = 100 cal/g = 4.2×10^5 J/kg

13 13 **Heat of Combustion:** (est.) −14,200 Btu/lb = −7900 cal/g = -33×10^6 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Data not available

Continued on page 1-65A

NOTES

VNT	# VINYLTOLUENE

Common Synonyms
p-Methylstyrene

Watery liquid | Colorless | Unpleasant odor

Floats on water

[illegible]

Fire

Combustible
Containers may explode in fire
[illegible]

Exposure

CAUTION [illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-447

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Methylstyrene
3 2 **Coast Guard Compatibility Classification** Olefin
3 3 **Chemical Formula** $CH_3C_6H_4CH{=}CH_2$
3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color** Colorless
4 3 **Odor:** Disagreeable

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** [illegible]
5 2 **Symptoms Following Exposure.** Vapor [illegible] drowsiness and anesthetic. Liquid [illegible]
5 3 **Treatment for Exposure:** INHALATION [illegible] and oxygen if needed. [illegible] INGESTION: DO NOT induce vomiting because of danger of aspiration. EYES: [illegible] SKIN: [illegible]
5 4 **Toxicity by Inhalation (Threshold Limit Value).** [illegible]
5 5 **Short-Term Inhalation Limits.** [illegible]
5 6 **Toxicity by Ingestion:** Grade 2 [illegible]
5 7 **Late Toxicity:** [illegible]
5 8 **Vapor (Gas) Irritant Characteristics:** [illegible]
5 9 **Liquid or Solid Irritant Characteristics.** [illegible]
5 10 **Odor Threshold** 50 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 135°F TOC (57°C TOC)
6 2 **Flammable Limits in Air** 0.9% - 11%
6 3 **Fire Extinguishing Agents** Water fog, foam, carbon dioxide or dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** [illegible]
6 7 **Ignition Temperature:** [illegible]
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Slowly [illegible] temperature rises above [illegible] Also polymerized by metallic salts such as those of aluminum
7 6 **Inhibitor of Polymerization** [illegible]

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Borden Inc
Borden Chemical Div
501 W Broad St
Columbus, OH 432
2. Dow Chemical Co
Midland, Mich 48640
3. Interchem Co Div
250 N Main St
[illegible]

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 90%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

V P C /

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Water Irritant	1
Toxicity	[illegible]
Poison	
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Reactivity	
Other Chemical	1
Water	0
Self-Reaction	1

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 118.18
13 3 **Boiling Point at 1 atm** [illegible]
13 4 **Freezing Point:** [illegible]
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.909 at 20°C (liquid)
13 8 **Liquid Surface Tension:** [illegible]
13 9 **Liquid-Water Interfacial Tension:** [illegible]
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13 12 **Latent Heat of Vaporization.** [illegible]
13 13 **Heat of Combustion:** [illegible]
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization** -243 Btu/lb (-565 kJ/kg)

[illegible]

NOTES

REVISED 1978

VTS

VINYLTRICHLOROSILANE

Common Synonyms

Trichlorovinylsilane
Trichlorovinylsilicane
Vinylsilicon trichloride

Liquid | Colorless to light yellow | Sharp choking odor

Reacts violently with water. Irritating gas is produced on contact with water.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR

Irritating to eyes, nose and throat.
Harmful if inhaled.

LIQUID

Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning. High flammability, corrosive air contaminant.
Restrict access.
Disperse any flash with care.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichlorovinylsilane, Trichlorovinylsilicane, Vinylsilicon trichloride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_2=CHSiCl_3$

3.4 **IMCO/United Nations Numerical Designation:** 1305

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Sharp choking like hydrochloric acid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Avoid vapor. Use respiratory protection, rubber gloves, chemical worker's goggles, other protective equipment as necessary to prevent skin and eye contact.

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membranes. Vapor irritates eyes. Contact with liquid causes severe burns of eyes and skin. Ingestion causes burns of mouth and stomach.

5.3 **Treatment for Exposure:** *Get medical attention following all exposures to this compound.* INHALATION: remove victim from exposure, give artificial respiration if required. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting, give large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} [illegible] mg/kg rats

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and severe injury to the eyes.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 60°F (O.C.), 92°F (C.C.)

6.2 **Flammable Limits in Air:** % (LEL)

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water, foam

6.5 **Special Hazards of Combustion Products:** Toxic chlorine and phosgene gases may be released in fire.

6.6 **Behavior in Fire:** Difficult to extinguish; reignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride gas.

6.7 **Ignition Temperature:** [illegible]°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible] mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously, evolving hydrogen chloride (hydrochloric acid)

7.2 **Reactivity with Common Materials:** Reacts with surface moisture to evolve hydrogen chloride which will corrode most metals and form flammable hydrogen gas.

7.3 **Stability During Transport:** Stable if protected from moisture

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** May occur in absence of inhibitor

7.6 **Inhibitor of Polymerization:** Diphenylamine, Hydroquinone

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640

3. Dynamit Nobel of America, Inc.
109 Stonehurst Court
Northvale, N.J. 07647

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** 96+% (vs Si)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

NO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	2
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 161.5

13.3 **Boiling Point at 1 atm:** 189°F = 90.6°C = 363.8°K

13.4 **Freezing Point:** −139°F = −95°C = 178°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.26 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 28 dynes/cm = 0.028 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 5.61

13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13.12 **Latent Heat of Vaporization:** 88 Btu/lb = 49 cal/g = 2.0 × 10⁸ J/kg

13.13 **Heat of Combustion:** (est.) −4,870 Btu/lb = −2,400 cal/g = −100 × 10⁸ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5A

NOTES

WCA	# WAXES: CARNAUBA

Common Synonyms

Thick liquid (heated) Yellow to dark brownish green Odorless

Floats on water and solidifies

Fire

Combustible

Exposure

LIQUID
Will burn skin and eyes.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Inert
3 3 **Chemical Formula:** Not pertinent
3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Yellow to dark brownish green
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, protective gloves and clothing for bulk liquid use
5 2 **Symptoms Following Exposure:** Heat can burn skin and eyes
5 3 **Treatment for Exposure:** SKIN OR EYE CONTACT: remove solidified wax from skin, wash with soap and water; if eyes are burned, irrigate and see MD
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Non-volatile
5 9 **Liquid or Solid Irritant Characteristics:** Hot wax can burn skin and eyes
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 540 °F C.O.C. 282 °C C.O.C.
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Petra Commodities Corp
111 Calvert St
Harrison, N Y 10528

2 W R Grace & Co
Conchlus Wax Refining Corp Division
50 National Rd
Edison, N J 08817

3 Frank L Ross Co
6 at Ash St
Jersey City, N J 07304

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Shipped in a variety of grades depending on source of wax and intended use All have about the same hazardous properties
10 2 **Storage Temperature:** Heated
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZAPD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

X T I

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Very high
13 4 **Freezing Point:** 176 - 183°F = 80 - 84°C = 353 - 357°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.998 at 25°C (solid)
13 8 **Liquid Surface Tension:** 32 dynes/cm = 0.032 N/m at 100°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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WPF	# WAXES: PARAFFIN

Common Synonyms Petroleum wax	Thick liquid (heated) Yellow to white Waxy odor Floats on water and solidifies
	[illegible]
Fire	Combustible Extinguish with [illegible]
Exposure	LIQUID Will burn skin and eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Petroleum wax
3.2 **Coast Guard Compatibility Classification:** Saturated hydrocarbon
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid or hard solid
4.2 **Color:** Yellow to white
4.3 **Odor:** Very weak

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, protective [illegible] and clothing for liquid wax
5.2 **Symptoms Following Exposure:** [illegible]
5.3 **Treatment for Exposure:** SKIN OR EYE CONTACT: [illegible] with soap and water. Unless called for, [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not [illegible]
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 1 Data [illegible]
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** None [illegible]
5.9 **Liquid or Solid Irritant Characteristics:** None
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water fog, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive
7.2 **Reactivity with Common Materials:** Not reactive
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

- W. R. Grace & Co.
  Cosmic Wax Refining Co. Division
  [illegible]
- [illegible]
- [illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Crude scale refined
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame at risers

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NFI

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (liquid)
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** -18,000 Btu/lb = -10,000 cal/g = -430 x 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

XLM — m-XYLENE

Common Synonyms
1,3-Dimethylbenzene
Xylol

Waterlike liquid | Colorless | Sweet odor

Floats on water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose, and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, or loss of consciousness.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Floating to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
3.2 **Coast Guard Compatibility Classification.**
3.3 **Chemical Formula:**
3.4 **IMCO United Nations Numerical Designation:**

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):**
4.2 **Color:**
4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:**
5.2 **Symptoms Following Exposure:**
5.3 **Treatment for Exposure:**
5.4 **Toxicity by Inhalation (Threshold Limit Value)**
5.5 **Short-Term Inhalation Limits:**
5.6 **Toxicity by Ingestion**
5.7 **Late Toxicity:**
5.8 **Vapor (Gas) Irritant Characteristics**
5.9 **Liquid or Solid Irritant Characteristics.**
5.10 **Odor Threshold:**

6 FIRE HAZARDS

6.1 **Flash Point:**
6.2 **Flammable Limits in Air:**
6.3 **Fire Extinguishing Agents:**
6.4 **Fire Extinguishing Agents Not to be Used:**
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:**
6.8 **Electrical Hazard:**
6.9 **Burning Rate:**

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:**
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:**
7.4 **Neutralizing Agents for Acids and Caustics:**
7.5 **Polymerization:**
7.6 **Inhibitor of Polymerization:**

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
8.2 **Waterfowl Toxicity:**
8.3 **Biological Oxygen Demand (BOD)**
8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
10.2 **Storage Temperature:**
10.3 **Inert Atmosphere:**
10.4 **Venting:**

11 HAZARD ASSESSMENT CODE

XYL

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fl	
Health	
Water Pollution	
Reactivity	

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
13.2 **Molecular Weight:**
13.3 **Boiling Point at 1 atm:**
13.4 **Freezing Point.**
13.5 **Critical Temperature:**
13.6 **Critical Pressure:**
13.7 **Specific Gravity:**
13.8 **Liquid Surface Tension:**
13.9 **Liquid-Water Interfacial Tension:**
13.10 **Vapor (Gas) Specific Gravity:**
13.11 **Ratio of Specific Heats of Vapor (Gas):**
13.12 **Latent Heat of Vaporization:**
13.13 **Heat of Combustion:**
13.14 **Heat of Decomposition:**
13.15 **Heat of Solution:**
13.16 **Heat of Polymerization:**

NOTES

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XLO	o-XYLENE

Common Synonyms
1,2-Dimethylbenzene
Xylol

Water: liquid | Colorless | Sweet odor

Floats on water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, or loss of consciousness.

Water Pollution

Dangerous to aquatic life in high concentrations.
Floating to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Personnel Safety Precautions, CG 446-6)

Isolate area for high flammability.
Evacuate area.
Should be removed.
Chemical and physical treatment.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2-Dimethylbenzene
3.2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon
3.3 **Chemical Formula:** o-$C_6H_4(CH_3)_2$
3.4 **IMCO/United Nations Numerical Designation:** 1307

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Benzene-like characteristic aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved canister or air supplied mask, goggles or face shield, plastic gloves and boots.

5.2 **Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, administer artificial respiration and oxygen if required, call a doctor. INGESTION: do NOT induce vomiting, call a doctor. EYES: flush with water. SKIN: wipe off, wash with plenty of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** 300 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 3; LD$_{50}$: 5000 mg/kg

5.7 **Late Toxicity:** Kidney and liver damage

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes slight smarting of eyes and respiratory system if present in high concentrations. Effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. If splashed on clothing and allowed to remain, may cause burning and reddening of the skin.

5.10 **Odor Threshold:** 0

5 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** [illegible]
6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]
6.5 **Special Hazards of Combustion Products:** [illegible]
6.6 **Behavior in Fire:** [illegible]
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** [illegible]
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** No reaction
7.5 **Polymerization:** Not reported
7.6 **Inhibitor of Polymerization:** Not reported

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD):** [illegible]
8.4 **Food Chain Concentration Potential:** [illegible]

9 SELECTED MANUFACTUREFS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Research reagent; Pure 99.5% Commercial [illegible]
10.2 **Storage Temperature:** [illegible]
10.3 **Inert Atmosphere:** [illegible]
10.4 **Venting:** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

2 T E

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Toxicity	
Liquid or Solid Irritant	
Poisons	1
Water Pollution	
Human Toxicity	
Aquatic Toxicity	1
Other Toxicity	2
Reactivity	
Other Reactivity	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 106.16
13.3 **Boiling Point at 1 atm:** 292.1°F = 144.4°C = 417.5°K
13.4 **Freezing Point:** -13.3°F = -25.2°C = 248.0°K
13.5 **Critical Temperature:** 674.1°F = 357.8°C = 631.0°K
13.6 **Critical Pressure:** 541.6 atm = 36.84 psia = 3.732 MN/m²
13.7 **Specific Gravity:** 0.880 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 30.1 dynes/cm = 0.0301 N/m at 15.6°C
13.9 **Liquid-Water Interfacial Tension:** 35.88 dynes/cm = 0.03588 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.66
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.094
13.12 **Latent Heat of Vaporization:** 434 Btu/lb = 92 cal/g = 4.3 × 10⁵ J/kg
13.13 **Heat of Combustion:** -17,344 Btu/lb = -9,636 cal/g = -403.4 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not reported
13.15 **Heat of Solution:** Not reported
13.16 **Heat of Polymerization:** Not reported

[illegible]

NOTES

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XLP	p-XYLENE

Common Synonyms
1,4-Dimethylbenzene
Xylol

Water: liquid Color: clear Sweet odor

Floats on water. Flammable, irritating vapor is produced.
Freezing point is 56° F.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, difficult breathing or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, loss of consciousness.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-2.

Evacuate area. Keep flammables away.
Evacuate area.
Shut off ignition.
Use water spray to reduce vapors.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,4-Dimethylbenzene
3.2 **Coast Guard Compatibility Classification:** Xylenes (Hydrocarbons)
3.3 **Chemical Formula:** $C_6H_4(CH_3)_2$
3.4 **IMCO United Nations Numerical Designation:** 1307

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Characteristic aromatic odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved canister-type respirator; rubber boots; safety goggles; rubber gloves and boots.

5.2 **Symptoms Following Exposure:** Vapor causes headache, dizziness, loss of consciousness and coma. Irritates eyes, causes watering of eyes, and vapor decomposition products. If ingested, causes nausea, vomiting, diarrhea, abdominal pain, loss of consciousness, and coma.

5.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. INGESTION: DO NOT induce vomiting; call a physician immediately. EYES: flush with plenty of water for at least 15 minutes. SKIN: wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** 200 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 3; LD50 not established

5.7 **Late Toxicity:** Kidney, liver damage

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes a slight smarting of the eyes and respiratory tract (nose and throat) in concentrations of 200 ppm or more.

5.9 **Liquid or Solid Irritant Characteristics:** Liquid causes irritation to skin with prolonged or repeated contact. Can be absorbed through intact skin in harmful amounts.

5.10 **Odor Threshold:** 0.08 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 81°F (27°C)
6.2 **Flammable Limits in Air:** 1.1% - 7.0%
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor may travel to source of ignition and flash back; containers may explode in heat of fire
6.7 **Ignition Temperature:** 867°F (464°C)
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** Moderate

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Grade 3 by Standard Test Procedure
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0 lb/lb in 5 days
8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

Amoco Chemicals Corp.
200 East Randolph Drive
Chicago, Illinois

ARCO Chemical
2nd North Broad St.
Philadelphia, Pa. 19102

Chevron Chemical Co.
Industrial Chemicals Division
575 Market St.
San Francisco, Calif. 94105

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Research 99.9% Pure 99.5% Technical 99.0%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3.

S.T.I.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Damage	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Fire)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 106.16
13.3 **Boiling Point at 1 atm:** 281.0°F = 138.3°C = 411.5°K
13.4 **Freezing Point:** 55.9°F = 13.3°C = 286.5°K
13.5 **Critical Temperature:** 649.2°F = 343.0°C = 616.2°K
13.6 **Critical Pressure:** 509.4 atm = 4665 psia = 3510 kN/m²
13.7 **Specific Gravity:** 0.861 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 28.1 dynes/cm = 0.0281 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 37 dynes/cm = 0.037 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.031
13.12 **Latent Heat of Vaporization:** 150 Btu/lb = 83 cal/g = 3.4 x 10⁵ J/kg
13.13 **Heat of Combustion:** -17,500 Btu/lb = -9702 cal/g = -406.4 x 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(continued on page 7 and 8)

NOTES

REVISED 1978

XYL

XYLENOL

Common Synonyms
Dimethylphenol
2-Hydroxytoluene
Cresylic acid
2,6-Dimethylphenol

Solid or liquid | Light yellowish brown | Sweet tarry odor

May float or sink in water

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
Harmful if inhaled

LIQUID OR SOLID
Irritating to skin and eyes
If swallowed or vapor is exposed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Foaming in shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO/United Nations Nomenclature Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:

Treatment for Exposure:
INHALATION
EYES
INGESTION

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 1110°F
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

1. Koppers Company, Inc.
Tar Products Division
Koppers Building
Pittsburgh, PA 15219

2. Crowley Tar Products Co.
295 Madison Avenue
New York, NY 10017

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications:

Category	Classification

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

5 HEALTH HAZARDS (Cont'd)

5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short Term Inhalation Limits:
5.6 Toxicity by Ingestion:
Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

ZNA	# ZINC ACETATE

Common Synonyms
Zinc acetate dihydrate
Dicarbomethoxyzinc
Zinc diacetate
Acetic acid zinc salt

Solid White Faint vinegar odor

Sinks and mixes with water

Fire

Not flammable

Exposure

DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause n[illegible]a and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if [illegible]nters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Acetic acid zinc salt Dicarbomethoxyzinc Zinc acetate dihydrate Zinc diacetate

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula.** $Zn(C_2H_3O_2)_2$ or $Zn(C_2H_3O_2)_2 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Faint acetic acid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Bu Mines approved respirator rubber gloves chemical goggles

5 2 **Symptoms Following Exposure** Inhalation causes mild irritation of nose and throat coughing and sneezing Ingestion can cause irritation or corrosion of the alimentary tract, resulting in vomiting Contact with dust causes irritation of eyes and mild irritation of skin

5 3 **Treatment for Exposure:** INHALATION move to fresh air if exposure is severe get medical attention INGESTION induce vomiting, followed by prompt and complete gastric lavage cathartics and demulcents EYES flush with water for at least 10 min consult physician if irritation persists SKIN wash with soap and water

5 4 **Toxicity by Inhalation, (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grp[illegible]e 2, LD$_{50}$ 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinen.

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** 0 88 ppm/96 hr fathead minnow TL m soft water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Zinc is not considered to be bioconcentrative even though it accumulates in some organisms

9 SELECTED MANUFACTURERS

1 The Harshaw Chemical Co
1945 E 97 St
Cleveland Ohio 44106

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

3 Union Carbide Corp
Chemicals and Plastics Div
270 Park Avenue
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent 99%
Commercial 98 4%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight** 219 49

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 1 74 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** (approx) = −0 5 Btu lb = −0 3 cal/g ≈ −0 0[illegible] × 10^3 J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ZAC — ZINC AMMONIUM CHLORIDE

Common Synonyms			
Ammonium pentachlorozincate Ammonium zinc chloride	Solid	White	Odorless
	Sinks and mixes with water.		

Avoid contact with solid and dust. Keep upwind.
Stop leak if possible.
Isolate and remove discarded material.
Notify local authorities if [illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If [illegible] contact skin and flush with plenty of water. If [illegible] stopped, [illegible]. If [illegible] is difficult, [illegible]. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water (one or two glasses at most) and induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVE CONVULSIONS, do not induce vomiting and do not give anything by mouth.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Method Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium pentachlorozincate, Ammonium zinc chloride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Zn(NH_4)_2Cl_4$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves.

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation.

5 3 **Treatment of Exposure:** INHALATION: remove from exposure, begin artificial respiration if breathing has ceased. INGESTION: induce vomiting followed by prompt and complete gastric lavage, cathartics and demulcents. EYES: flush with water for at least 15 min. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate.** Not pertinent.

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** Zinc accumulates in some organisms but is not considered to be biococoncentrative

9 SELECTED MANUFACTURERS

1 Chemical and Pigment Co
600 Nichols Road
Pittsburg, Calif 94565

2 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford, Conn 06902

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 296.8

13 3 **Boiling Point at 1 atm:** (sublimes) 644°F = 340°C = 613°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.81 at 20°C (solid)

13 8 **Liquid Surface Tension:** No pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Data not available

13 16 **Heat of Polymerization:** Not pertinent

(Continued on next page)

NOTES

ZAR — ZINC ARSENATE

Common Synonyms

Solid | Colorless | Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST

POISONOUS IF INHALED

Irritating to eyes, nose and throat

SOLID

POISONOUS IF SWALLOWED

Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown

May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant

Restrict access

Should be removed

Chemical and physical treatment

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** (approx.) $(ZnO)_4As_2O_5$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1712

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, rubber gloves

5 2 **Symptoms Following Exposure:** Dust may irritate eyes. Ingestion or excessive inhalation of dust causes burning of mouth, abdominal pain, vomiting, diarrhea with hemorrhage, dehydration, jaundice, and collapse.

5 3 **Treatment for Exposure:** EYES: flush with water to remove dust. INGESTION: immediately induce evacuation of intestinal tract by inducing vomiting and giving gastric lavage and saline cathartic; see physician at once; consider development of arsenic poisoning.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** May be carcinogenic. Arsenic poisoning may develop.

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

Pfaltz and Bauer, Inc.
126-08 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 866 (approx.)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 3.31 at 15°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

ZBO ZINC BORATE

Common Synonyms	Solid	White	Odorless
	Sinks in water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** (approx.) $2ZnO \cdot 3B_2O_3 \cdot 3.5H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion can cause gastrointestinal disturbances, convulsions, central nervous depressions, skin eruptions, shock, and death. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: administer gastric lavage with warm tap water, saline cathartic, consult physician. EYES or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³ (as boric oxide)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 1, LD_{50}: 5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Zinc accumulates in some organisms but is not considered to be biococoncentrative

9 SELECTED MANUFACTURERS

1 U.S. Borax & Chemical Co.
3075 Wilshire Blvd.
Los Angeles, Calif. 90010
2 Humphrey Chemical Corp.
P.O. Box 21
Edgewood Arsenal, Md. 21010
3 American Hoechst Corp.
Chemicals and Plastics Div.
Rt. 202 - 206 North
Somerville, N.J. 08876

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial grades contain 45 - 52% zinc oxide, 29 - 35% boric anhydride
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.:** Solid
13 2 **Molecular Weight:** 434.75
13 3 **Boiling Point at 1 atm.:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.7 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5ZBO

NOTES

ZBR — ZINC BROMIDE

Common Synonyms	Solid	White	Odorless
	Sinks and mixes with water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

- 3 1 **Synonyms:** No common synonyms
- 3 2 **Coast Guard Compatibility Classification.** Not listed
- 3 3 **Chemical Formula.** $ZnBr_2$
- 3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

- 4 1 **Physical State (as shipped)** Solid
- 4 2 **Color:** White
- 4 3 **Odor:** None

5 HEALTH HAZARDS

- 5 1 **Personal Protective Equipment:** Chemical goggles or face shield rubber gloves dust mask
- 5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat Ingestion can cause irritation or corrosion of the alimentary tract If large amount is swallowed and not thrown up drowsiness and other symptoms of bromide poisoning may occur Contact with eyes or skin causes irritation
- 5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amount of water induce vomiting followed by prompt and complete gastric lavage catharsis and demulcents EYES or SKIN wash immediately with large volumes of water
- 5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
- 5 5 **Short-Term Inhalation Limits** Data not available
- 5 6 **Toxicity by Ingestion:** Grade 2; LD_{50} 0.5 - 5 g/kg
- 5 7 **Late Toxicity** Data not available
- 5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
- 5 9 **Liquid or Solid Irritant Characteristics** Data not available
- 5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

- 6 1 **Flash Point** Not flammable
- 6 2 **Flammable Limits in Air.** Not flammable
- 6 3 **Fire Extinguishing Agents** Not pertinent
- 6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
- 6 5 **Special Hazards of Combustion Products:** Not pertinent
- 6 6 **Behavior in Fire**
- 6 7 **Ignition Temperature** Not pertinent
- 6 8 **Electrical Hazard.** Not pertinent
- 6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

- 7 1 **Reactivity with Water:** No reaction
- 7 2 **Reactivity with Common Materials:**
- 7 3 **Stability During Transport:** Stable
- 7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7 5 **Polymerization:** Not pertinent
- 7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8 1 **Aquatic Toxicity:** Data not available
- 8 2 **Waterfowl Toxicity** Data not available
- 8 3 **Biological Oxygen Demand (BOD).** None
- 8 4 **Food Chain Concentration Potential** Zinc accumulates in some organisms but is not considered a biological concentrate

9 SELECTED MANUFACTURERS

1. American Hoechst Corp
   Chemicals and Plastics Div
   Rt 202 - 206 North
   Somerville, N J 08876
2. Michigan Chemical Corp
   351 E Ohio St
   Chicago, Ill 60611
3. Fisher Scientific Co
   711 Forbes Ave
   Pittsburgh, Pa 15219

10 SHIPPING INFORMATION

- 10 1 **Grades of Purity:** technical 98% +
- 10 2 **Storage Temperature:** Ambient
- 10 3 **Inert Atmosphere:** No requirement
- 10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

- 12 1 **Code of Federal Regulations.** Not listed
- 12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
- 12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13 1 **Physical State at 15°C and 1 atm:** Solid
- 13 2 **Molecular Weight:** 225.18
- 13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)
- 13 4 **Freezing Point:** Not pertinent
- 13 5 **Critical Temperature.** Not pertinent
- 13 6 **Critical Pressure:** Not pertinent
- 13 7 **Specific Gravity:** 4.22 at 20°C (solid)
- 13 8 **Liquid Surface Tension** Not pertinent
- 13 9 **Liquid-Water Interfacial Tension:** Not pertinent
- 13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
- 13 12 **Latent Heat of Vaporization** Not pertinent
- 13 13 **Heat of Combustion:** Not pertinent
- 13 14 **Heat of Decomposition:** Not pertinent
- 13 15 **Heat of Solution** Not pertinent
- 13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

ZCL

ZINC CHLORIDE

Common Synonyms

Solid White solid Odorless

Solid sinks and mixes with water

Fire

Not flammable

Exposure

SOLID OR SOLUTION
Irritating to skin and eyes
If swallowed will cause nausea or vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4)

Issue warning - water contaminant
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** ZnCl
3 4 **IMCO United Nations Numerical Designation.** NO 1840

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield
5 2 **Symptoms Following Exposure:** Solid or water solution is astringent and can irritate the eyes When ingested can cause stimulation severe irritation of stomach nausea vomiting and diarrhea
5 3 **Treatment for Exposure:** INGESTION give large volumes of water and induce vomiting repeat process call doctor EYES wash with water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion.** Grade 3 LD$_{50}$ 350 to 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Non volatile
5 9 **Liquid or Solid Irritant Characteristics.** Solid irritates skin on prolonged contact
5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
2 ppm 96 hr medium bluegill TLm fresh water
38 ppm 48 hr zebrafish TLm salt water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Division
Morristown N J 07960
2 Gould Marathon Battery Co
Wausau Wis 54402
3 Mallinckrodt Chemical Works
Industrial Chemicals Division
2nd and Mallinckrodt Sts
St Louis Mo 63160

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent USP technical 50% solution in water
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Not required
10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-2)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive Material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 136.28
13 3 **Boiling Point at 1 atm:** Very high
13 4 **Freezing Point:** 541°F = 283°C = 556°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.91 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

continued on pages 5 and 6

NOTES

REVISED 1978

ZCR	# ZINC CHROMATE

Common Synonyms			
Zinc chromate(VI) hydroxide Zinc yellow Buttercup yellow	Solid Sinks in water	Yellow	Odorless

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Buttercup yellow, Zinc chromate(VI) hydroxide, Zinc yellow

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** (approx.) $4ZnO \cdot K_2O \cdot 4CrO_3 \cdot 3H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Suitable respirator (for dusts), rubber gloves, chemical goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract, circulatory collapse and toxic nephritis. Contact with eyes or skin causes irritation.

5 3 **Treatment for Exposure:** INHALATION move to fresh air, if exposure has been severe get medical attention. INGESTION induce vomiting, followed by prompt and complete gastric lavage, catharsis and demulcents. EYES flush with water. SKIN wash thoroughly with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 - 5 g/kg

5 7 **Late Toxicity:** Possible lung cancer

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Both chromium and zinc are concentrated by some organisms but are not considered a problem concentrate in a spill situation.

9 SELECTED MANUFACTURERS

1. Mineral Pigments Corp.
   7811 Muirkirk Road
   Beltsville, Md. 20705
2. Fisher Scientific Co.
   711 Forbes Ave.
   Pittsburgh, Pa. 15219
3. Pfaltz and Bauer, Inc.
   375 Fairfield Ave.
   Stamford, Conn. 06902

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial 100%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NN

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 874 (approx.)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 3.43 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

ZDP — ZINC DIALKYLDITHIOPHOSPHATE

Common Synonyms		
Zinc dialkyldithiophosphate Zinc dialkylphosphorodithioate	Solid or liquid Sinks in water	Straw yellow to green Sweet, alcohol like odor

Fire	Combustible Irritating gases may be produced when heated
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing LIQUID OR SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: Water contaminant
Recreational uses
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Zinc O,O-di-n-butylphosphorodithioate; Zinc di-sec-butylphosphorodithioate; Zinc di-sec-butyl-O,O-dithiophosphate

3 2 **Coast Guard Compatibility Classification:** Not Listed

3 3 **Chemical Formula:** $[(RO)_2PSS]_2Zn$ where R=Cyclohexyl

3 4 **IMCO/United Nations Numerical Designation:** 6.1 PG I

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or liquid

4 2 **Color:** Straw yellow to yellow green

4 3 **Odor:** Sweet, alcohol like

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, safety glasses or face shield, dust respirator for solid form

5 2 **Symptoms Following Exposure:** (All commercially available members of this class have about the same health hazards.) Inhalation of dust can cause respiratory disorder. Ingestion causes irritation of mouth and stomach. Contact with eyes can cause moderate to severe irritation. Contact with skin causes mild irritation.

5 3 **Treatment for Exposure:** INHALATION: move from exposure. INGESTION: if large amounts have been ingested, induce vomiting. EYES: flush with clean, warm water for at least 15 minutes, consult a physician. SKIN: wash affected areas with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0.5 - 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 360°F C.C.

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur and phosphorus may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction at ordinary temperatures

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Zinc accumulates in some organisms but is not considered to be biocontentrative

9 SELECTED MANUFACTURERS

1 Lubrizol Corporation
P O Box 0166
Cleveland, Ohio 44109

2 Monsanto Company
800 N Lindbergh Blvd
St Louis, Mo 63166

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 62% on inert filler

10 2 **Storage Temperature:** Below 66°C (150°F)

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

(Liquid) X Y Y
(Solid) II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15 °C and 1 atm:** Solid or liquid

13 2 **Molecular Weight:** 548 (approx.)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.12 - 1.26 at 20°C (liquid); 1.6 at 20°C (solid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next card

NOTES

ZFB — ZINC FLUOROBORATE

Common Synonyms
Zinc fluoborate solution

Liquid | Colorless | Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4:

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Zinc fluoborate solution
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $ZnBF_4 \cdot H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, safety glasses or face shield
5 2 **Symptoms Following Exposure:** Ingestion may cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation
5 3 **Treatment For Exposure:** INGESTION: give emetic, lavage, cathartics, and demulcents. EYES: flush with plenty of water, get medical attention. SKIN: flush with plenty of water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 - 5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Zinc accumulates in some organisms but is not considered to be biconcentrative

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp.
P. O. Box 1057R
Morristown, N. J. 07960
2. Platte and Baker Inc.
359 Fairfield Ave.
Stamford, Conn. 06902

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Purified 41% solution in water
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

AP

12. HAZARD CLASSIFICATION

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 216.98 (mixture only)
13 3 **Boiling Point at 1 atm:** approx. 212°F = 100°C = 373°K
13 4 **Freezing Point:** Data not available
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.45 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 3 of 4

NOTES

ZNT	# ZINC NITRATE

Common Synonyms
Zinc nitrate hexahydrate

Solid White Odorless

Sinks and mixes with water

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Zinc nitrate hexahydrate

3.2 **Coast Guard Commodity Classification:** Not listed

3.3 **Chemical Formula:** $Zn(NO_3)_2 \cdot 6H_2O$

3.4 **IMCO/United Nations Numerical Designation:** NA 1514

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White crystals

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with eyes causes irritation which may be delayed. Contact with skin causes irritation.

5.3 **Treatment for Exposure:** INHALATION move to fresh air. INGESTION induce vomiting followed by prompt and complete gastric lavage, cathartics and demulcents. EYES flush with water, consult a physician. SKIN wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. Oral LD_{50} 1.7 g/kg (rats)

5.7 **Late Toxicity:** Causes enlarged liver, spleen, and bone marrow in rabbits

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6.6 **Behavior in Fire:** May increase intensity of fire when in contact with combustible material

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
1.50 ppm 3-mo tadpoles survived but no limb buds fm h water
>2 ppm 48 hr barnacles 90% lethal alt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Zinc is accumulated in some organisms but is not considered to be biomagnified

9 SELECTED MANUFACTURERS

1. The Harshaw Chemical Co
[illegible]
Cleveland Ohio 44106

2. J T Baker Chemical Co
Phillipsburg N J 08865

3. Mallinckrodt Chemical Works
2nd and Mallinckrodt Streets
St Louis Mo 63160

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Solid oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0
	OX

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 297.47

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 92°F = 36°C = 309°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.07 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 3

NOTES

ZPS	# ZINC PHENOLSULFONATE

Common Synonyms			
Zinc p-phenolsulfonate Zinc sulfocarbolate Zinc sulfophenate Zinc phenolsulfonate octahydrate	Solid	White	Odorless
	Sinks and mixes with water		

Fire	Not flammable Irritating gases may be produced when heated.
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause cough or difficult breathing. SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** p-Hydroxybenzenesulfonic acid zinc salt; Zinc p-phenolsulfonate; Zinc phenolsulfonate octahydrate; Zinc sulfocarbolate; Zinc sulfophenate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $(C_6H_5O_4S)_2Zn \cdot 8H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion of large doses has emetic and cathartic effects and can cause irritation or corrosion of the alimentary tract. Contact with eyes causes irritation. Contact with skin causes mild irritation

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: If large amount has been swallowed, induce vomiting, followed by prompt gastric lavage or barium and demulcents. EYES or SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 0.5 - 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur may form on fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Zinc is accumulated by some organisms but is not considered to be biomagnified in the food chain

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp
Specialty Chemicals Div
P O Box 2057R
Morristown, N J 07960

2. Mallinckrodt Chemical Works
2nd and Mallinckrodt Streets
St Louis, Mo 63160

3. Pfanstiehl Laboratories, Inc
1219 Glen Rock Ave
Waukegan, Illinois 60085

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** None

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Solid

13.2 **Molecular Weight:** 455.6

13.3 **Boiling Point at 1 atm:** (decomposes) 248°F = 120°C = 393°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** > 1 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 of 8

NOTES

ZPP	# ZINC PHOSPHIDE

Common Synonyms	Solid	Grey to black	Faint odor
	Sinks in water		

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause dizziness, difficult breathing, or loss of consciousness.

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause dizziness, nausea, vomiting or loss of consciousness

Water Pollution

Toxic at low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Isolate hazard, prevent water contamination
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** Zn_3P_2
3.4 **IMCO/United Nations Numerical Designation:** No. 1714

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Grey to grey-black
4.3 **Odor:** Faint phosphine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask or self-contained breathing apparatus, goggles, face shield, protective gloves

5.2 **Symptoms Following Exposure:** When inhaled or ingested, compound releases phosphine which causes faintness, weakness, nausea, vomiting, dizziness, pulse, blood pressure changes, pulse rate disturbed, intense thirst, convulsions, paralysis, and coma. Contact with eyes or skin causes irritation.

5.3 **Treatment for Exposure:** INHALATION: move to fresh air, give artificial respiration if required, get medical attention for phosphine poisoning. INGESTION: give one tablespoonful of mustard in a glass of warm water, repeat until vomit fluid is clear, avoid use of alcohol, call physician immediately, have patient lie down and keep warm. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 40 mg/kg rat
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Use water. Use in dry chemical or adjacent fires.
6.4 **Fire Extinguishing Agents Not to be Used.** Not applicable. Avoid carbon dioxide or halogenated agents as will liberate phosphine gas and spontaneously flammable gas.
6.5 **Special Hazards of Combustion Products.** Irritating oxides of phosphorus may be formed in fires.
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly with water, more rapidly with dilute acid to form phosphine gas, which is toxic and spontaneously flammable.
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable unless exposed to moisture, form phosphine gas may then be released and collect in closed spaces.
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Zinc is accumulated by some organisms but is not considered to be biologically [illegible]

9 SELECTED MANUFACTURERS

[illegible] Chemical Corp.
Industrial Chemicals Div.
Niagara Falls, N.Y. [illegible]

2. American Metals Corp.
Chemicals and Plastics Div.
P.O. 202, 296 North
Somerville, N.J. 08876

Ethel Smelting Co.
731 Forbes Ave.
Pittsburgh, Pa. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 94%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 258.1
13.3 **Boiling Point at 1 atm:** 1042°F = 1410°C = 1683°K
13.4 **Freezing Point:** Transforms 752°F = 400°C = 673°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 4.55 at 15°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

ZSL	# ZINC SILICOFLUORIDE

Common Synonyms
Zinc hexafluorosilicate
Zinc fluosilicate
Zinc silicofluoride hexahydrate

Solid | White | Odorless

Sinks and mixes with water

Fire

Not Flammable
Irritating gases may be produced when heated

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause injury, vomiting or loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning - water contaminant
Disperse and flush

2. LABELS

No Hazard Label required by U.S. DOT
Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Zinc fluosilicate
Zinc hexafluorosilicate; Zinc silicofluoride hexahydrate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $ZnSiF_6 \cdot 6H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White, transparent

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, chemical goggles or face shield, neoprene gloves

5.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat; eye vapor inhalation may cause severe pneumonitis and edema. Ingestion causes nausea, vomiting, shock, convulsions, weakness, and other symptoms. Prolonged or repeated contact with eyes, nose, or mouth causes irritation, or rashes may develop.

5.3 **Treatment for Exposure:** INHALATION: Get victim to fresh air. INGESTION: Induce vomiting by giving soapy water or mustard in water. Have patient drink large quantities of water. If necessary, give stimulant such as strong coffee. EYES: flush with water. Call physician as necessary. SKIN: wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ as fluoride

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Oral LD [illegible] strong acid

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Fumes and mists of hydrogen fluoride and silicon tetrafluoride may be produced in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Zinc is accumulated by marine organisms, but is not considered to be biomagnified

9 SELECTED MANUFACTURERS

1. [illegible]
Agricultural Chemicals Group
Baltimore, Md. 21[illegible]

2. American Chemical [illegible]
P.O. Box [illegible]
Pelican Point Complex, Fla. 33[illegible]

3. American Hydrite Corp.
Chemicals and Plastics Div.
Rt. 30 at North
Somerville, N.J. 08[illegible]

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical, 90% min.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.10 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

ZSF	ZINC SULFATE

Common Synonyms
White vitriol
Zinc vitriol
Zinc sulfate heptahydrate

Solid | White | Odorless

Sinks and mixes with water

Fire

Not flammable

Exposure

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Dispersal and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** White vitriol, Zinc sulfate heptahydrate, Zinc vitriol

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $ZnSO_4 \cdot 7H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Colorless

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation.

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: induce vomiting followed by prompt and complete gastric lavage (stomach pump) and demulcents. EYES or SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50}: 0.5 - 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.2 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.1 mg Ta/l/96 hr stickleback
lethal *
4.6 ppm/96 hr rainbow trout 14 °C
fresh water
*Water type not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:**
Zinc is accumulated by some organisms but is not considered to be bioaccumulative

9. SELECTED MANUFACTURERS

1. Chemicals and Pigments Co.
[illegible] School Road
Pleasant Gap, [illegible]

2. Eagle Picher Industries, Inc.
Agricultural Chemicals Division
P.O. Box [illegible]
Galena, Kansas [illegible]

3. J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

XX

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 287.51

13.2 **Boiling Point at 1 atm:** Not pertinent, decomposes

13.4 **Freezing Point:** decomposes [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.96 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(continued on page [illegible])

NOTES

ZCA

ZIRCONIUM ACETATE

Common Synonyms	Liquid	White	Weak vinegar odor
	Sinks and mixes with water		

[illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]
[illegible]

Water Pollution

Effect of low concentrations on aquatic life Unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Zirconium acetate solution
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula:** $Zr(C_2H_3O_2)_4$–HOH
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color.** Colorless
4 3 **Odor** Weak vinegar

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves chemical goggles or face shield
5 2 **Symptoms Following Exposure:** Has only a mild pharmacologic reaction Contact with eyes or skin may cause irritation
5 3 **Treatment for Exposure** INGESTION give large amount of water EYES flush with water for at least 15 min consult a physician if irritation persists SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** 5 mg m³ (as Zirconium)
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 5 g/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air.** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire**
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available.
8 4 **Food Chain Concentration Potential.** Data not available.

9. SELECTED MANUFACTURERS

1 The Harshaw Chemical Co
1945 E 97 St
Cleveland Ohio 44106

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades of Purity** 25% solution in water
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight.** 327 (solute only)
13 3 **Boiling Point at 1 atm** Not pertinent
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity** 1 37 at 20°C (liquid)
13 8 **Liquid Surface Tension** Data not available
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on next Card

NOTES

ZIR — ZIRCONIUM NITRATE

Common Synonyms
Zirconium nitrate pentahydrate

Solid | White | Odorless

Sinks and mixes with water

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and purging

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. Water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Zirconium nitrate pentahydrate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Zr(NO_3)_4 \cdot 5H_2O$
3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Has only a mild pharmacological action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure.** INHALATION: move to fresh air. INGESTION: give large amount of water. EYES or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] (as zirconium)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Grade 2; oral LD_{50} = 2.5 g/kg (rat)
5 7 **Lute Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable but may intensify fire
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen may form in fire
6 6 **Behavior in Fire.** May increase intensity of fire when in contact with combustible materials
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Dissolves to give an acid solution
7 2 **Reactivity with Common Materials** Will corrode most metals
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 Vanlac Chemical Co
666 South Front Street
Elizabeth N J 07202
2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514
3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99+%
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **HAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 429.3
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 2.1 at 20°C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on next Card)

NOTES

ZCO ZIRCONIUM OXYCHLORIDE

Common Synonyms
Zirconyl chloride
Basic zirconium chloride
Zirconium oxychloride hydrate
Zirconium oxide chloride

Solid | White to yellow | Odorless

Sinks and mixes with water

[illegible] with sodium hydroxide
Stops gas organisms
Is [illegible]
Not available on pollution [illegible]

Fire

Not flammable

Exposure

[illegible]

DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Basic zirconium chloride Zirconium oxide chloride Zirconium oxychloride hydrate Zirconyl chloride
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula.** $ZrOCl_2 \cdot 8H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not Listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color:** Yellow to white
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses or face shield protective gloves dust mask
5 2 **Symptoms Following Exposure:** Has only a mild pharmacological action Inhalation of dust may irritate nose and throat Contact with eyes or skin cause irritation
5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amount of water EYES or SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 5 mg/m (as zirconium)
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion** Grade 2 oral LD_{50} = 5 g/kg (rat)
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire.**
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
240 ppm/96 hr/fathead minnow/TLm hard water
18 ppm/96 hr fathead minnow TLm/ soft water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 SCM Industries Inc
[illegible] Division
4511 Hyde Park Blvd
Niagara Falls N Y 14305
2 Ventron Inc
P O Box 159
Beverly Mass 01915
3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical Pure
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight.** 322 3
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** >1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** No pertinent
13 16 **Heat of Polymerization:** Not pertinent

Compressibility [illegible]

NOTES

ZCS

ZIRCONIUM SULFATE

Common Synonyms
Disulfatozirconic acid
Zirconium sulfate tetrahydrate

Solid | White | Odorless

Sinks and mixes with water

Avoid contact with solid and dust. Keep away from water supplies and sewers. Isolate and remove discharge. Control runoff. Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

SEE FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
Do not get water directly on material. Do not get material in eyes, on skin, or on clothing. Avoid breathing dust.

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Keep upwind. Avoid breathing dust. Wash skin with soap and water.
IF IN EYES, wash with plenty of water for at least 15 minutes.
IF SWALLOWED, do NOT induce vomiting. Give plenty of water to drink.
IF SWALLOWED and victim is CONSCIOUS, GIVE SEVERAL GLASSES OF WATER TO DRINK.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous to water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Disulfatozirconic acid
Zirconium sulfate tetrahydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Zr(SO_4)_2 \cdot 4H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Has only a mild pharmacodynamic action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water. EYES or SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³ (as zirconium)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 5 g/kg (rats)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
14 ppm as Zr/96 hr fathead minnow TL$_m$, soft water
145 ppm/96 hr fathead minnow TL$_m$, hard water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Vanderlaan Chemical Co
666 South Front Street
Elizabeth, N J 07202

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford, Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 355.4

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (approx.) 3.0 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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COMMANDANT INSTRUCTION M 16465.12

LIST OF EFFECTIVE PAGES

SUBJECT MATTER	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	i (reverse blank)	original (Oct 78)
COMDTINST M 16465.12	iii (reverse blank)	original
Record of changes	v (reverse blank)	original
Table of Contents	vii to viii	original
1. Introduction	1-1 (reverse blank)	original
2. Components of CHRIS	2-1 to 2-2	original
3. Explanation of terms	3-1 to 3-19 (reverse blank)	original
4. Other Information systems	4-1 to 4-5 (reverse blank)	original
5. Conversion Factors	5-1 to 5-4	original
6. Selected Properties	6-1 to 6-4	original
7. Guide to Compatibility	7-1 to 7-17 (reverse blank)	original
8. Index of Synonyms	8-1 to 8-54	original
9. Index of Codes	9-1 to 9-14	original
10. Data sources	10-1 to 10-6	original
11. Chemical specific Information	11-1 (reverse blank) 11-3 to 11-903	original original